Vol. XX, No. 4
SEPTEMBER 1953

THE SCIENCE TEACHER

1953 WINNERS OF Science Achievement Awards

- Future Supply of Science and Math Students
- Symposium—Provisions for the Rapid Learner
- Using Science Books in the Elementary School
- Visual Aids and Problem-Solving Teaching
- Wanted: Science Teachers for Tomorrow

JOURNAL OF THE NATIONAL SCIENCE TEACHERS ASSOCIATION

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BE A BETTER BREAKFAST BOOSTER IN YOUR COMMUNITY

Young Women Eat Better Breakfast, According To Cereal Institute Study

CHICAGO — An improvement in the amount of breakfast eaten by young women is reported by the Cereal Institute, Inc., here, from a survey conducted by Elmo Roper.

Questioning 3,489 women between the ages of 20 and 35, the research organization found that 53 per cent reported they had had two or more solid foods to eat for breakfast. In 1949, the percentage giving this answer was 50. Twenty-nine per cent last year reported they had one solid and 17 per cent no solid food at all.

Also, 38 per cent of young women last year estimated they got 25 per cent or more of their daily nourishment at breakfast, compared to 31 per cent giving this answer in 1949.

The Roper survey reports "there is good acceptance of the idea that people need three regular meals a day—when they are talking about their husbands or their children."

HISTORY OF BETTER BREAKFASTS

In 1943 when the Cereal Institute was established, a study was made of what had been done in the past to promote Better Breakfast habits because with the shift over the years of the population from rural to urban living a change in eating habits took place. It was found that in 1917 during World War I that Uncle Sam had promoted this idea for war production morale purposes. But from 1917 to 1943 we find a big gap wherein the subject was given little or no attention. During World War II Uncle Sam again promoted Better Breakfasts with the slogan "Eat a Better Breakfast and Do a Better Job" and the Walt Disney poster slogan, "You Can't Breakfast Like a Bird and Work Like a Horse." At this time the Cereal Institute cooperated with this program on the national, state, and community levels. When the war was over the government dropped its Better Breakfast Program and the Cereal Institute picked up the Better Breakfast ball and has been carrying it ever since.

The Cereal Institute until recently was alone in planning research, educational, and publicity programs to promote the Better Breakfast Program. Now there are many on the Breakfast Bandwagon and the more the merrier because all doing so are making an important contribution to the betterment of the nutritional health of the nation.

Breakfast Research Grants

Over the years the Cereal Institute has provided research grants to Purdue University, Harvard University, University of Georgia, and the School of Medicine of the State University of Iowa. The purpose of these grants in the main was to explore breakfast eating habits. The Iowa Breakfast Studies have demonstrated that Better Breakfast habits are essential for maximum efficiency, both mental and physical, during late morning hours, that good breakfast habits are beneficial and that a basic cereal breakfast is a sound one.

Third Annual Event

September, when eating habits are re-established for the school and work days ahead, was selected as the ideal month by professional leaders for the promotion on a nation-wide basis to improve breakfast eating habits. This nation-wide event was stimulated by the fact that over 100 cities and towns and several state-wide Better Breakfast Programs have been organized in recent years. This September the third annual Better Breakfast Month is being launched as a contribution to the betterment of the nutritional health of the country.

It's good news that Better Breakfast habits are in the making but more Better Breakfast Boosters are needed because only one out of five children goes to school with a good breakfast. Sixty per cent of teen-age girls neglect breakfast. Sixty per cent of adult women and over 40 per cent of the men skip or skimp on breakfast. You will do a service to your community to promote Better Breakfasts.

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135 South LaSalle Street, Chicago 3, Illinois
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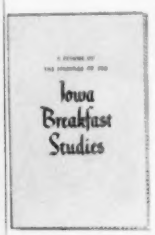
THREE CURRENT SCIENTIFIC BREAKFAST REPORTS

Findings of Iowa Breakfast Studies Reports



Free copies of this interesting 12 page resume booklet are available to you on your letter of request to the Cereal Institute. It describes carefully the effects of altered breakfast habits on both college men and women over a three year period.

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The subject matter in this 24 page attractively illustrated booklet is based on current scientific and library research and is edited by a leading authority. It is available free on your letter of request, and you may have 25 free copies for office use.

Summary of the Iowa Breakfast Studies on Aged Men

This 12 page booklet summarizes the carefully controlled studies on the effects of altered breakfast habits on a group of men 60 to 80 years of age. A free copy is available to you on your letter of request. If you desire 25 for staff or office use please so state in your letter.

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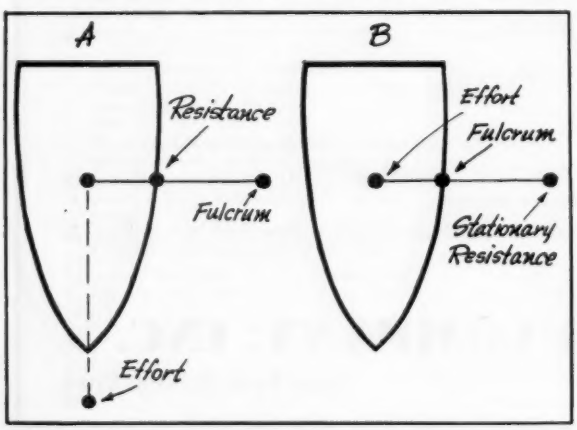
THIS MONTH'S COVER . . . shows Patrick Ledden at work on his science project, "Alumina Chromatography," which won Honorable Mention in the 1953 program of Science Achievement Awards. He was 16 years old and in the 11th grade (last year) of Fort Wayne, Indiana Central Catholic High School. Two other students from this school also won Honorable Mention for their work.

Reader's Column

I recently wrote to the author of the general science text that we use and pointed out that he has an error in his diagram and explanation of the oar of a rowboat acting as a lever. He classified the oar as a second-class lever; it ought to be classified as a first-class lever. Since I have detected the same error in at least one physics textbook, perhaps it would be helpful to discuss this problem for readers of *TST*.

The oar of a rowboat is a second-class lever *only when the effort or force comes from OUTSIDE the boat,* as shown in A in the diagram. The fulcrum is in the water, the resistance is at the oar lock, and the force is at the handle. This is the "wheelbarrow effect" and a mechanical advantage of more than one is produced.



The above situation hardly ever exists and the oar should be classified as a first-class lever, as shown in B in the diagram.

As shown, the force or effort comes from WITHIN the boat, the resistance is in the water, and the fulcrum is at the lock. If we consider the boat with its oar as a simple machine, we can look at the problem this way. It makes no difference whether we have a stationary resistance and a moving machine or a moving resistance and a stationary machine, providing that the force comes from WITHIN the machine. This gives a mechanical disadvantage in the case of the oar with its short handle and long blade.

ERVIN SCHNEIDER
Albany, Minnesota

(EDITOR'S NOTE: *This discussion is wide open if you wish to get in on it.*)

I plan to be in Colorado in October (on a Ford Foundation Fellowship) and may be able to attend the regional conference. The regional meeting in Atlanta and the national convention in Pittsburgh last year were interesting and stimulating. Although a member of NSTA for several years, I had never attended a December or June meeting. After attending the two meetings last year, I see more clearly that much is accomplished toward better science teaching through the facilities you extend us. We are grateful to the Association for these opportunities.

LOUISE STAKELY
Atlanta, Georgia

I am very much interested in getting sample copies of the *Elementary School Science Bulletin* and the brochure describing the enrollment plan into the hands of our elementary principals.

If you will supply me with enough copies for 51 principals I will distribute them along with a memorandum urging them to enter a subscription.

You are doing a fine job. I do hope we can interest more of our people in the NSTA program.

HAROLD L. BODA
Assistant Superintendent
Dayton, Ohio

As a student I find myself constantly referring to THE SCIENCE TEACHER for research or reference in my classes. I would like to subscribe at the student rate. Would you please let me know the procedure for doing this as soon as possible?

T. W. JOHNSTON
University of Chicago

THE SCIENCE TEACHER

The Journal of the National Science Teachers Association, published by the Association, 1201 Sixteenth Street, N. W., Washington 6, D. C. Membership dues, including publications and services, $4 regular; $6 sustaining; $2 student (of each, $1.50 is for Journal subscription). Single copies, 50¢. Published in February, March, April, September, October, and November. Editorial and Executive Offices, 1201 Sixteenth Street, N. W., Washington 6, D. C. Copyright, 1953, by the National Science Teachers Association. Entered as second-class matter at the Post Office at Washington, D. C., under the Act of March 3, 1879. Acceptance for mailing at Special rate of postage provided for in the Act of February 28, 1925, embodied in paragraph (d), Section 34.40 P. L. & R. of 1948.

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Coming - - -

in the October issue of *The Science Teacher*

- Try the Inductive Approach
- Elementary Science—"Science Maturity" and "Classroom Ideas"
- A Contemporary Science Problem: Fluoridation of Public Water Supplies
- Ten-Thousand-Year-Old Classroom

Something new is being added—"The Editor's Column." It's purely a personal desire to "sound off" now and then to others than our office staff on things that seem important. Perhaps the editor should simply edit and otherwise keep his typewriter quiet. I'll be looking forward to *your* reaction.

—o—

My blood pressure has been pretty high at times during the past few months as I have read of developments in the National Bureau of Standards case revolving around the controversial battery additive AD-X2. You will recall that the Secretary of Commerce in his firing of Dr. Allen V. Astin, the Director of the Bureau, said that the Bureau had not been "sufficiently objective" in its tests of the product and that Bureau scientists overlooked "the play of the market place" in such matters. Fired, then reinstated to be fired later, and recently completely cleared and invited to continue as Director of the Bureau, Dr. Astin has indicated that he will stay on.

What does it all add up to for science teachers? In my mind it emphasizes that Dr. Anton J. Carlson was ever so right when he said in his 1941 Sigma Xi address: "The greatest thing in science is the scientific method, controlled and rechecked observations, recorded with absolute honesty and without fear or favor. Science in this sense has as yet scarcely touched the common man or his leaders."

Those of us who teach "science" should keep this thought in mind *all the time*. We can get the youngsters to learn (at least for a while) the value of average atmospheric pressure, or a statement of Ohm's law, or the names of the bones in the human skeleton. Important though these items may be, if this is the only kind of science we teach, if we do not seek and find ways to teach what the scientific endeavor is like and what scientists are like and how they do their work—then we are not doing nearly enough to help prevent situations in which efforts may be made to crucify future Dr. Astin's on a pile of non-scientific testimonials.

—o—

What do you look for and read first of all when a new issue of *TST* reaches you? That question is just an excuse for suggesting that you look pretty quick at our "Clip n' Mail" offerings (page 211 in this issue). I know that our "Classroom Ideas" pages are popular; and I know, too, that we need more of this kind of article. If each NSTA member would write such a piece only once every three years, we'd have more than we could run. How about pitching in and sharing your good classroom ideas with others?

Attention-NSTA MEMBERS and READERS OF TST . . . .

(Please continue)

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(Please continue)

The second of these books is sent free of charge as a "bonus" to Life and Sustaining Members of NSTA. Regular members who transfer to Life or Sustaining Membership *now* (or when renewing for 1954) will also receive the bonus book.

Both of the above books should be in the libraries and science education departments of *all* teacher training institutions.

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THE SCIENCE TEACHER

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The National Science Teachers Association is a department of the National Education Association and an affiliate of the American Association for the Advancement of Science. Established in 1895 as the NEA Department of Science Instruction and later expanded as the American Council of Science Teachers, it merged with the American Science Teachers Association and reorganized in 1944 to form the present Association.

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FUTURE SUPPLY OF SCIENCE AND MATHEMATICS STUDENTS

By

DAEL WOLFLE

THE technological advances of this country during the Twentieth Century have been made possible by a steadily increasing number of men and women engaged in engineering, the sciences, and mathematics. Without a substantial number of trained and competent workers in these fields we could not have brought antibiotics, television, radar, the jet engine, and countless other products and process to their high state of development. While the supply of scientists and engineers has made possible these products of research and development, those products have, in turn, created increasing demands for more scientists, more engineers, more mathematicians, and more technicians. We might go even further in exploring the relationships between technological progress on the one hand and the supply of and demand for scientists on the other. If we had adequate methods of measuring the variables involved, I suspect that we would find some kind of direct relationship between the rate at which we are experiencing technological change and the size of the resulting demand for scientists and technologists.

Certainly we are in a period of rapid change. Some of the military weapons of World War II are now antiques. Some of today's weapons will be just as antiquated five years from now. Medicinal agents which were in their exploratory stages a few years ago are now in daily and economical use. The television industry has mushroomed from almost nothing to its current size in the years since World War II came to an end. There is no need to multiply examples, but I cite the speed of change as an indication that we can anticipate a continued demand. We do not have the techniques with which to state with confidence that next year we will need so many thousand engineers or the year after so many thousand physicists. Exactly how many will be demanded we have no way of forecasting, but that we are in state of rapid technological and social change and that that condition is likely to continue for some time into the future is a more fundamental fact than any specific estimate of exactly how many scientists and engineers we need at the moment. The number required will continue to increase until the nation's leaders decide, as result of changed world conditions, as a result of legislative action, or for some similar reason, that the United States is going to slow down its rate of technological advance.

It is widely assumed that the demand for scientific manpower is likely to be greater than will be the supply which can normally be expected, and that it behooves us to attempt to get more bright youngsters interested in science and mathematics in order to augment the future supply. Before examining the probable future supply and considering methods by which it might be increased it seems desirable to take a look at the present supply.

The easier group to describe is engineers, for there is a little greater agreement over who is an engineer than there is over who is a scientist, and there is more information available about the engineering profession than there is about natural scientists as a group.

As of today, the number of engineers in the United States

is just about half a million. That is approximately 12 times as many as we had in 1900 and almost twice as many as in 1940. Not all of the engineers have graduated from college, but somewhat over 80 per cent are college graduates and the proportion is steadily increasing. We must expect the great bulk of replacements and of new additions to come from the nation's engineering colleges.

There are too many unknowns involved to permit us to estimate the future supply with precision, but I can indicate the order of magnitude of some of the major variables. For the next few years we can compute from the age distribution of living engineers and from standard life tables that approximately 7,000 of those under the age of 65 will die each year. From college enrollment information we can be pretty certain that the number of new graduates will remain under 25,000 a year for the next several years. Just how many will withdraw from engineering to enter other fields will depend upon future conditions, but the number is always substantial. Moreover, not all engineering graduates go into engineering work, and neither the military services nor their own inclination lead us to expect that all future graduates will become engineers. In short, it is completely certain that engineering can not increase as rapidly during the next few years as it has during the past three or four. There just aren't enough in the pipeline.

As for scientists, the Bureau of Labor Statistics estimated that we had 175,000 employed in 1950. The Research and Development Board has estimated that we have 204,000 in 1952. Who qualifies for the label of scientist is not a question to which there is any one clear answer. Preliminary data suggest that in the neighborhood of 125,000 college graduates enumerated in the 1950 census were classified as scientists. That figure is almost exactly the same as an estimate made by the Research and Development Board that there were 123,000 research scientists in the United States in 1950. Their estimate of research scientists for 1952 is 135,000. Perhaps we ought not to take any of these specific figures too seriously. We can, however, take from them the generalization that the country's scientists are less than half as numerous as the country's engineers. From comparable estimates for earlier years we can also make the generalization that the nation's scientists have approximately doubled in number since 1940.

A study conducted by the American Council on Education for the Office of Naval Research (Douglas E. Scates, Bernard C. Murdoch, and Alice V. Yeomans, *The Production of Doctorates in the Sciences:* 1936-1948, Washington, D. C.: American Council on Education, 1951) has provided estimates of the number of living persons who have received Ph.D. degrees in the natural sciences from American Universities. The estimate is that there were 39,000 such persons alive and not over 70 years of age in 1950. When we add the more recent Ph.D.'s in the sciences we arrive at a current estimate of 46,600 for the number of persons with Ph.D. degrees from American universities who are living and under the age of 70.

There is an interesting property of these estimates; engineers, scientists, research scientists, and persons holding the doctorate in science have all, in round numbers, doubled since 1940. During the war years the increase was small; most of it has taken place since 1946. During those years we have made great strides in increasing our resources of scientific manpower. But the United States has not been alone in that regard. A paper published

National problems of adequate scientific manpower, and the role of high school science teachers in helping to solve these problems, have been very much in print lately. However, we doubt that the issue is being "overdone," especially when we can publish such a broad and reasoned discussion as this one.

Dr. Wolfle's paper constituted part of the introduction to a conference on *Identifying High School Students with Potential for Science and Mathematics and Providing Opportunities for Their Development* which was held in Washington, D. C. on November 13-15 under the joint auspices of the U. S. Office of Education and the Cooperative Committee on the Teaching of Science and Mathematics of the American Association for the Advancement of Science. A 34-page report of this conference, titled *Education for the Talented in Mathematics and Science*, is now available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.; price 15 cents.

Born in Puyallup, Washington, Dr. Wolfle has the B. S. from the University of Washington, the M.S. from the University of Chicago, and the Ph.D. from Ohio State University. He has served on the faculties of Ohio State University, the University of Mississippi, and the University of Chicago. He is Executive Secretary of the American Psychological Association and is presently director of the Commission on Human Resources and Advanced Training of the National Research and Development Board.

This paper has also appeared in *The Mathematics Teacher*, April, 1953.

recently by Shimkin of the Russian Research Center at Harvard (Demetri Shimkin, "Scientific Personnel in the USSR," *Science* 116, 1952, 512-513) indicates that graduates of higher educational institutions employed in professional positions in the USSR more than doubled in number between 1937 and 1952. Russia too has been making great strides in increasing her corps of engineers, natural scientists, agricultural specialists, physicians, industrial leaders, language specialists and other professional workers. We can certainly not be complacent that our rapid increases insure us continuing scientific superiority.

School and College Populations

We should therefore analyze school and college populations to see what quantity and quality of replacements and additions to our scientific population we are likely to secure during the next few years. Of the general result we can be certain: we are not going to have as many graduates in the sciences during these next few years as we have recently had. The GI wave is about over. For the next few years we will have to depend upon the normal age group for our college graduates. And current age groups are small. The number of people reaching college entrance age is now at the bottom of a trough, smaller than it was during the Forties and much smaller than it will be when the large baby crops of the war and postwar years grow old enough to enter college. Out of the current small age groups, however, we can expect a slightly but steadily increasing percentage to graduate from college. Our studies of the past trends lead us to the conclusion that the number of college graduates, expressed as a percentage of all young men and women reaching the age of 22, increases on the average of .3 of a percentage point each year. In terms of concrete numbers, that means that we can expect 265,000 graduates in 1955 and 326,000 in 1960. These figures can be compared with the 186,500 we had in 1940, the greatly inflated 434,000 in 1950, and the less inflated 325,000 this year. Since the peak year of 1950, graduating classes have been getting smaller and smaller. We can expect the decrease to continue until about 1955. The number will then begin to increase again.

How many of the future graduates will have specialized in the sciences is a question of particular interest. We have attempted to determine the past trends with respect to the distribution of college graduates among different fields of specialization. In order to do that we have combined partial data from a number of sources and have supplemented those data with a couple of historical sample studies of our own. The net result is a conclusion that the percentage of college graduates who have majored in one of the natural sciences has been dropping rather steadily from 1900 to 1950. In 1900 a fourth of all recipients of bachelor's degrees had specialized in one of the sciences; in 1950 only an eighth had majored in a science. During the same 50 years the percentage majoring in agriculture and engineering has remained fairly constant. The percentage for engineering has been dropping slightly for the past five years, but will begin to show an increase in 1955. The number of freshmen engineering students in the fall of 1951 was some ten per cent higher than it had been a year earlier, and in 1952 freshmen engineers were up 32 per cent above 1951. Both of these figures show that engineering has for the past two years attracted an unusually large number of freshmen men. The graduating class of engineers in 1955 can be expected to be a little above the class of 1954 and the class of 1956 can be expected to show an even larger increase.

Figures are not available for equally precise statements about the number of graduates to be expected in mathematics, physics, chemistry, and the other sciences, but there is a very real possibility that a part of the prospective increases in engineering graduates will be at the expense of decreased numbers in mathematics and the sciences.

Important Conclusions

While these figures and speculations do not indicate just how many future graduates in the sciences we can count on, they permit several important conclusions: (1) the total number of college graduates will continue to decrease until about 1955, after which the number will begin to rise; (2) The number of engineering graduates will decrease to 1954 and then begin to increase; (3) The number of graduates in mathematics and the natural sciences will drop for the next few years and may continue to decline longer than will the total number or the number in engineering, for a part of engineering's gain may be coming out of the science fields; (4) The graduates in the sciences during these immediately future years will not be numerous enough to continue the rapid rate of increase of recent years.

All of these statements have been made before. They are, in fact, the background against which there have developed a number of attempts to in-

terest more high school graduates in careers in engineering and science. The efforts of the Engineers Joint Council is one example. The Future Scientists of America organization is another. In support of such ventures is clear evidence that there are lots of bright boys and girls who finish high school but do not enter college. If we take as a point of reference the level of ability of the average college graduate of today, as measured by the score he makes on a test of general academic aptitude or intelligence, we get the following figures. Of all of the boys and girls in the country who are at least as bright as the average college graduate—about the top fifteen per cent of the total population—forty per cent finish high school but do not go to college; twenty per cent start college but do not finish; and forty per cent became college graduates. If we take a more or a less selective level of ability as our standard of reference the percentages naturally change, but the one illustration is sufficient to indicate that there are lots of able youngsters who might make good college material but who do not get to, or at least through, college.

Why Students Do Not Continue

The reasons for this loss are multiple. The first to occur to most of us is lack of money. But money is not the only reason holding these boys and girls out of college. In a not yet published study of all of the Minnesota high school graduates of 1950, Ralph Berdie found that about half of those who were in the top ten per cent as measured by the American Council on Education Psychological Examination but who were not going to college the following year said that they would go to college if they had the money. The other half indicated that they would not plan to attend college even if funds were available. The student's attitudes, the educational aspirations which he develops for himself, the attitudes towards higher education of his family and friends, all of the elements which we can lump together under the general heading of motivation and interests appear to be at least as powerful an element in keeping a number of potentially good students out of college as is the lack of money.

I summarized the first portion of this paper with the statement that we can not expect as many college graduates in engineering and the sciences in the next few years as we have had in the past few years and not enough to enable the scientific fields to continue their growth at the recent rapid rate. Earlier I had pointed to the great technological changes of the current period as evidence of the continued high need. We can now add another generalization: there is a sufficiently large supply of ability in the youth of the country to make it possible to double or perhaps more than double the number of college graduates of the caliber which now constitutes the upper half of college graduating classes.

The importance of attempts to interest more bright youngsters in science and mathematics is therefore established. Science needs good brains. The nation's advancing technology needs a steady stream of new scientifically trained recruits. To identify high school students with potential for science and mathematics and to provide opportunities for their development is a contribution to the talented young people involved and a contribution to the future welfare of the society they can serve.

But the task of identifying high school students with potential for science and mathematics is a problem which involves a number of issues. How, for example, does a high school student with potential for science and mathematics differ from a high school student with potential for medicine, economics, linguistics, or any one of a number of other fields which are also important and which also have a right to claim a portion of the most promising young students. Our own studies of the intellectual quality of students who specialize in different fields indicate that students of mathematics and science are on the average slightly better than the generality of college students but that overlap from one field to another is very large indeed. There are other fields which now command as qualitatively good a group as do the natural sciences. For example students receiving degrees for major work in psychology, English, foreign languages, medicine, and law average as high as those whose baccalaureate majors were in the natural sciences.

A deliberate effort to draw a larger number of abler students into science and mathematics can be developed along either of two lines. If the appeal is general, to all high school students who are potentially good scientists, then the appeal is one which may reduce the number of students entering other fields. If the effort is directed at students who would not otherwise enter college, then science and mathematics may profit without detracting from other fields. This second alternative seems to me both the more desirable and the more difficult of the two alternatives—the more desirable because it is calculated to increase the total number of high quality people receiving advanced training and the

(Please continue on page 210)

SCIENCE PROVISIONS FOR THE RAPID LEARNER —*a Symposium*

Coordinated by SAMUEL W. BLOOM

WE in the public schools must adapt our curricula to provide for all American children[1]—the "halt and the lame," the "poor and the rich," the "slow learner," and the "rapid learner."[2] There are two tenets upon which our educational procedures are based: First, education is the democratic prerogative of all American children. Second, children have many educational needs in common but differ in many significant respects.[3]

There is general agreement with the democratic ideal that all children irrespective of race, color, creed, or economic circumstance should have equal opportunities to acquire the basic fundamental skills of learning in order as Paul A. Witty says, "to bring about the maximum development of every boy and girl according to his unique nature and needs." A good command of the English language as the means for communication of ideas, arithmetic and the understanding of number relationships, the fundamentals of science and an understanding of the world around us, social studies and history for the better appreciation of mankind and his problems, and adequate vocational guidance are all equally important in preparing the individual for maximum contributions to the welfare of society. These are the tools by means of which sound judgement and skills can be developed based on critical thinking and thorough knowledge. These are the rights and privileges of every American boy and girl.

Meeting the needs created by individual differences has long been "standard" in American education. We have within the scope of our abilities and competence done a most satisfactory job with the average and below-average student. However, very often, we have not completely met the needs of the boy or girl who is a rapid learner. Rapid learners usually do well "on their own," with or without teacher assistance. Generally, we can assume little credit for their performance. Often, however, their full potential is not achieved due to lack of proper stimulation and motivation by a good teacher.

All educators, including science teachers, are aware of the seriousness of maintaining a flow of competent students into our institutions of higher learning in engineering and other scientific fields. There is an estimated need of 30,000 engineers per year during the present decade. Our colleges are turning out engineering graduates considerably below this number. The estimated graduates for the next few years lead us to examine more carefully the potential of the students in our classrooms.

Year	*Total anticipated engineering graduates*[4]
1953	24,000
1954	19,000
1955	22,000
1956	29,000

Even more alarming is the report of the National Manpower Council[5] which indicates the needs of at least 53,000 teachers and between 22,000 to 45,000 physicians by 1960. Of the nation's 700,000 scientists, only 15,000 are engaged in basic research.

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[1] Educational Policies Commission. *Education for All American Children.* National Education Association and the American Association of School Administrators. Washington, D. C. 1948

[2] The term "rapid learner" as used in this symposium will be synonymous with such other expressions as: "gifted," "high ability children," "high scientific potential," "more capable learner" and other similar terms. (Suggested by Paul Witty.)

[3] Educational Policies Commission. *Education for All American Youth.* National Education Association and the American Association of School Administrators. Washington, D. C. 1944

[4] Engineering Manpower Newsletter #33, March 15, 1953. Engineering Manpower Commission of Engineers Joint Council, 29 West 39th Street, New York 18, New York.

[5] *A Policy for Scientific and Professional Manpower.* Report by the National Manpower Council at Columbia University's Graduate School of Business. Columbia University Press, New York City, 1952.

Perhaps we should re-examine our pupil's interests. He that is competent and has demonstrated interest in science should be encouraged to follow these interests vocationally. He should be assisted in every way to continue his education. It has been pointed out that in many states half of the estimated number of rapid learners fail to go to college.[1] Lack of proper motivation is a major contributing factor in this respect. This is a waste that should be explored more critically. When an individual does not produce at his highest potential, he loses as an individual, but more important we lose as a nation.

We, as science teachers, can and must do something about this. We can learn to identify the potential scientist We can provide him with the stimulating experiences which will continue to nurture his scientific interests. We can make him aware of possibilities in the fields of science. From the limited numbers of rapid learners will come the creative force of tomorrow. The average boy or girl can be trained as a technician of the future, but the real creative work will be done by the individual with imagination, with high general intelligence, and the ability to think in the abstract. He is in our classroom today—we must find him and provide him with the variety of experiences which will bring out his latent talents and encourage him to work to capacity. We must provide him with the knowledge and appreciation of science and the scientific method. We must provide challenging situations. We must reach him early in his school experience. As Brandwein [2] has indicated "there is no doubt that future scientists are influenced or can be influenced by the opportunities made available to them early in life" Are we as teachers doing what we can?

How we can identify the rapid learner

In defining the term "rapid learner," we must consider whether we are stressing academic achievement, unusual talent in science, the artistic fields, or the ability to exercise constructive social leadership.[3] Paul Witty [4] defines the gifted child as one "whose performance in worthwhile types of endeavor is consistently remarkable." The Educational Policies Commission[1] has suggested that the top 1% of the total population with respect to intellectual capacity be considered as "highly gifted." There is no general agreement as to just who is the "rapid learner" but for practical consideration we can use some of the characteristics enumerated by various writers to assist us in identifying the rapid learner.

Howard F. Fehr,[2] Teachers College, Columbia University, has listed general ways to identify students with scientific and mathematical potential. He lists the characteristics of the rapid learner as:

1. Having an extraordinary memory
2. The ability to perform abstractly at a high level
3. The ability to apply knowledge
4. Intense intellectual curiosity
5. Persistent goal
6. Intuition—the talented student has insight and penetrability to the problem under consideration.
7. An extensive vocabulary and facility of expression
8. A scientific hobby which is hard ridden
9. Virtuosity. The gifted student gives things a new turn. It is not only curiosity, but it is a creative aspect that able students seem to possess.
10. Sound knowledge of science in advanced areas

Brandwein[3] states that there is no such quantity as "science talent"; but in identifying students with high potential, he found them to possess:

1. Very high intelligence as measured by standardized I.Q. tests
2. High mathematical ability
3. High verbal ability

Esther G. Nolan [4] suggested the following characteristics as helpful in identifying the rapid learner:

1. High score on intelligence test—using more than one
2. Outstanding verbal ability and vocabulary development
3. Fine reasoning power with ability to perform abstract thinking
4. Great amount of ingenuity

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[1] Witty, Paul A. *School and Society*. 76: 177-181, September 20, 1952.
Hollinshead, Byron S. "Who Should Go To College?" Columbia University Press, New York, 1952.
Wolfle, Dael. "Future Supply of Science and Mathematics Students." *The Mathematics Teacher*. 46: 225-229, 240; April, 1955.

[2] Brandwein, Paul F. "Selection and Training of Future Scientists." *Science Education*. 35: 251-253; December, 1951.

[3] Corey, Stephen M. "The Discovery of Outstanding Talent in Youth." *The Education Digest*. 12: 1-4; April, 1947.

[4] Witty, Paul A. (Editor) *The Gifted Child*. The American Association for Gifted Children. D. C. Heath, Boston, 1951.

[1] Educational Policies Commission. *Education of the Gifted*. National Education Association and the American Association of School Administrators. Washington, D. C. June 1950.

[2] Fehr, Howard F. "General Ways to Identify Students with Scientific and Mathematical Potential." *The Mathematics Teacher*. 46: 230-234; April, 1953.

[3] Brandwein, Paul. *Op. cit.*

[4] Nolan, Esther Grace. "The Gifted Student: His Problem and Ours." *California Journal of Secondary Education*. 22:180-3; March, 1947.

With this issue of *The Science Teacher,* we have been privileged to bring to a head, so to speak, one of the best collections of assorted experiences and ideas for working with the "upper end of the ability spectrum" to be found anywhere. Look back through recent issues of *TST* at the variety and scope of such articles and then add in three that are appearing in this issue, and we think you'll heartily agree. This issue brings you a symposium on "Science Provisions for the Rapid Learner," "Future Supply of Science and Mathematics Students," and "Wanted: Science Teachers For Tomorrow."

About the symposium—Samuel Bloom has been teacher of chemistry, general science, and photography at Monroe High School in Rochester, New York for 18 years. Last year he was on leave of absence as a Fellow of the Fund for the Advancement of Education (Ford Foundation). Like several of the Fellows, he included Washington in his itinerary and stopped in at our NSTA office for a chat. Before he got away, he agreed that as he pursued his travels and observations he would "work up a symposium" on the subject of this article. It has been a tremendous lot of work and we extend our deep and sincere gratitude to him as coordinator of the project. Also, we appreciate the thought and effort that the symposium contributors have poured into the project. We are confident that this article will be welcomed and will prove helpful, and that it will take a firm place in the literature of science education.

Bloom has also been chemistry instructor for two years in the Syracuse College of Forestry. The positions and institutional connections of the symposium contributors are indicated in connection with each of their contributions.

5. Capacity for logical planning
6. Evidence of prolific originality and creative and artistic ability

Administrative provisions for the rapid learner

The provisions that may be made administratively are experimental in nature. No one method has been shown as definitely superior to another. The consensus of present day opinion seems to indicate that enrichment with some acceleration depending on the emotional and physical development of the child is perhaps the most desirable. There are proponents for each of these various provisions:

1. Acceleration
2. Segregation (Special Schools)
3. Enrichment
4. Ability groupings
5. Electives
6. Co-curriculum programs

In our symposium, we attempt to present the methods of approach used in widely separated geographical areas. Regardless of the method used, it is the teacher who is most concerned with the proper motivation and stimulation of the child. It is the teacher who can do most to stimulate imagination and creative scientific curiosity. It is the teacher upon whom the success of any program must depend.

The desirable traits for a teacher of the rapid learner[1] are not unique. They are desirable for all teachers—but perhaps to a greater degree in a teacher of the rapid learner. A teacher should:

1. Be a well adjusted individual who is genuinely responsive in human relations.
2. Have a good disposition and express consistent behavior.
3. Have a friendliness and constructive attitude towards people.
4. Have a genuine respect for the integrity of the individual.
5. Have an understanding of modern educational psychology and understanding of human growth and development.
6. Be able to discover and encourage creative abilities.
7. Be intellectually nimble and flexible.
8. Be unusually proficient in teaching a particular subject.

Participation in this symposium

Due to space limitations, we have selected reports in this symposium from eight selected areas to illustrate the provisions being made for the rapid learner in science from the elementary school through the high school. No attempt was made to cover each of the various science subjects generally found in the twelve years of school. The excellent individual work being done in the many smaller high schools is also not mentioned. In each case, the participants represent teachers who are doing unusually fine work in and out of the classroom and whose successful procedures are worthy of record. We hope their experiences will result in a greater recognition of the rapid learner and his educational needs.

(Please continue on page 182)

[1] Paul A. Witty. *Op. cit.* Chapter 6.

Demonstrations with Power Company Meters

By **MARTINUS VAN WAYNEN**
Instructor of Physics, Berkeley High School, Berkeley, California

Photos by JOHN HARVILLE
Assistant Professor of Science, San Jose State College, San Jose, California

HOW many science teachers are taking advantage of equipment available from their local power companies? These public utility companies usually are quite generous in donating useable gas, electric, and water meters. As a matter of fact when we asked for a water meter we were sent two.

The public utilities should be pleased to help schools because it is to their advantage to have our coming citizens familiar with the operation of their meters and with the calculation of the monthly power bills. Science teachers certainly recognize the problem as a practical and very useful one.

In figure 1 two meters are shown—one cut-away

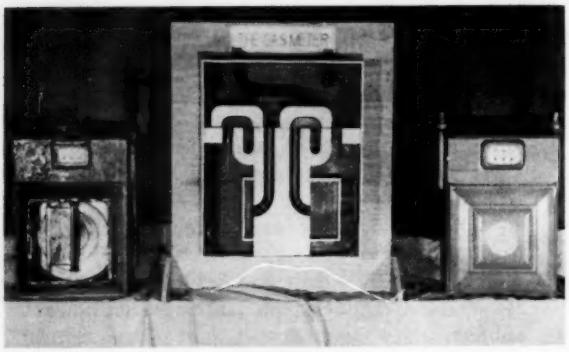


FIGURE 1

and one in its original form, separated by a three-dimensional, operational model built by one of our former pupils. Learning how a gas meter operates from a two-dimensional drawing is a slow and highly unrewarding teaching experience. With the model and the meter side by side, we get our lesson over in a matter of minutes with complete understanding.

At the same time we measure the gas pressure of one of our laboratory jets by means of a water manometer and calculate gas bills from sets of dial readings and copies of our local gas rates which are available at the utility offices.

In the case of the water meters (fig. 2) we find a four-stage diagram of the revolving disk best for explanation of its operation, which incidentally is every bit as novel and interesting as that of the

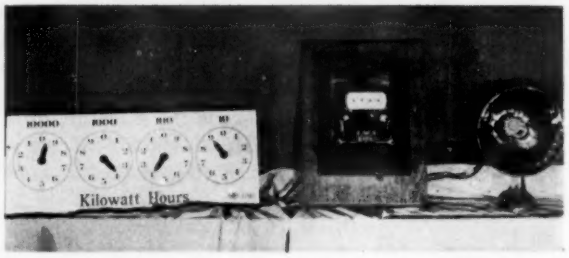


FIGURE 2

gas meter. Here too, water bills can be calculated from meter settings and the local rate schedules.

In figure 3 a watthour meter is shown connected to a 120-volt table outlet and connected through to a radiant heater. This setup is more realistic than the former two because of the visible rotating of the aluminum disk of the meter and the heat radiating from the heater. Here it is actually possible to see the meter reading change without incurring the inconvenience which one would experience with the gas and water meters. The real situation, of course, is to be preferred at all times. Meter readings can again be taken and bills calculated from rate schedules.

Depending on one's laboratory facilities, other practical problems involving utility charges can be developed. If the school's meters are accessible, classes might read them at stated intervals and check the monthly bills.

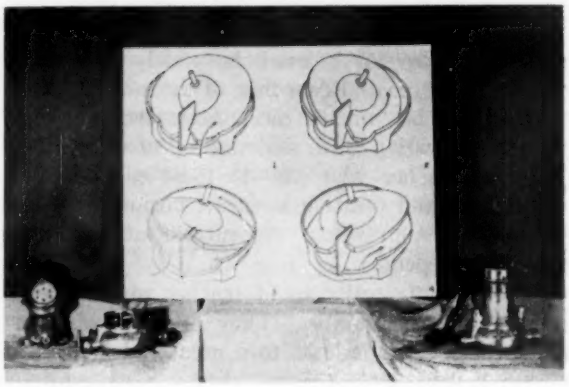


FIGURE 3

USING SCIENCE BOOKS IN THE ELEMENTARY SCHOOL

By GLENN O. BLOUGH

Specialist for Elementary Science, U. S. Office of Education

THERE'S CONSIDERABLE CONFUSING TALK about using textbooks in elementary science. Supervising personnel often say to teachers: "Don't use your science books as readers." A few educators say: "We don't use textbooks at all in our science teaching." And they say it with considerable pride. Another frequently heard comment is, "We use a few copies of several sets of books instead of many copies of one set." These three comments represent some of the problems related to using science books in the elementary school.

Teachers legitimately might reply to the first comment: "Okay, I won't use my science books as readers, but how then *do* I use them?" The answer is, of course: "You use them just as you do any other learning tool, as you do your social studies texts, as you do any other textbook provided you're not a pages-by-pages teacher." But there are still many teachers who feel that science teaching in the elementary school is a somewhat strange breed of learning. So for them, let us illustrate one way to use science books—not as readers but as learning tools when they are needed.

First let's set down a few examples of times where science books are essential in helping pupils in their problem solving: When they need suggestions about how to use materials to solve the problems (to find experiments that help); when they need to find information that will help to check the results of their own experiments (so often simple experiments are limited in what they show pupils cannot, or should not, make sweeping generalizations from them); when they need information that they cannot get through first-hand experimentation and observation; when they want to find additional information to supplement their own discoveries; when the book contains pictures, diagrams, graphs and other visual aids that will shed some light on the problems. These are some of the more obvious reasons for "getting out the books."

How would this work in a classroom? Suppose the sixth grade is preparing to solve some problems related to how they use electric current in their community. The first steps are taken, not in the book, but where people use electric current. Pupils as a home assignment: "Observe all of the places where you see electricity being used—at home, in school, on the way to and from school, and elsewhere." A compiled list is made and there is discussion about the list centered on the problem of: "How was the electricity being used and what was it actually doing?" As a result of these observations, problems such as the following are raised: (Only a few samples are given to illustrate the method.)

1. Where does the electricity come from?
2. Could we make and use some electricity here in our room?
3. Where does the electricity in our automobiles come from?
4. How can a flashlight battery and a dry cell make electricity?
5. How do wires carry electricity?

Pupils decide to tackle problems 4 and 2 as a beginning. They bring a worn out dry cell and some flashlight batteries and open them to see what's inside. Then the problems arise: "What are these things? How can they make electricity?" Now where do they go? To the book. Not "To read the next 5 pages and tell the teacher what the pages say." They go to find the answers to the questions. To do this they read only a page or two. After the reading, they re-examine the cell, using the information they have read to see how the cell makes electricity. The book also has a diagram of the dry cell which is used in identifying the parts.

During the reading, the pupils discover a picture of a simple wet cell. This will help them with their problem 2. "Could we make it? Let's see what we need?" Pupils read to find materials that are needed. They, together with the teacher, find the materials. "Now how shall we find out how to use them?" Use the book. The children read only the necessary directions. They perform the experiment, but alas (fortunately perhaps!) the wet cell doesn't work. "Why not? Have we followed the directions carefully?" They reread and perform the experiment more carefully. It works. "But

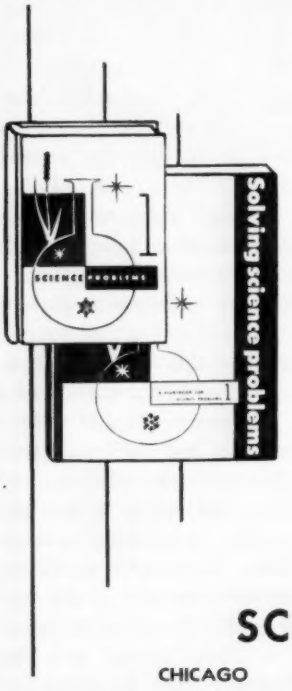
how does the wet cell make the electricity?" Pupils give their ideas. "How can we tell who is right?" They again go to the book to find the answer.

Perhaps we have gone far enough to illustrate that the book is not being used as a reader. It is being used as a source of information, for checking, for learning how to do, and as a visual aid. To be sure, this brief description represents only *one* way to use the book. But the process of getting into the book when it is needed and out of it when other ways of discovery are needed, continues as the pupils go on to solve their problems.

Now what can be said to the people who say "We don't use any textbooks at all?" This is probably as shortsighted as is a page-by-page use of the book without ever getting out of it. People, in general, rely heavily on printed material for information. Some people are smarter than others at getting the most out of such printed matter. Some are more intelligent than others about evaluating what they read. Some are more adept in knowing how to locate what they want and in reading only what they need for a specific purpose. Most people believe that these skills are essential. It stands to reason that these abilities may develop through skillful use of textbooks and other printed matter throughout the grades and junior and senior high school. *They will if we intend to make such an outcome an objective of our teaching.* And if we continue to learn more and more about how to use books to bring about these outcomes.

Some of the disparaging remarks about so-called "textbook teaching" are perhaps unjustly leveled at books themselves when, in fact, they might be aimed at *our ways of using tools.* Comparisons between recent and older textbooks indicate great progress in all phases of book making. Will a comparison of recent and older methods of classroom teaching reveal as great progress in all respects? Perhaps teachers need more practical help with using textbooks more effectively in their teaching-learning situations. Teachers need to *experience* good use of textbooks in the classes they attend in pre-service education and in summer schools. They need opportunity to *see* some other teachers using textbooks effectively. They need a more thorough understanding of what is meant by "not using the textbook as a reader", "using many texts instead of only one", "not making science a textbook subject." Unless such statements as these have real meaning, they are of little use in improving practices. It is quite possible that we are not getting the most from our investment in textbooks because we have not given sufficient attention to how to use them most effectively.

WORKING TOGETHER . . .



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Visual Aids AND THE PROBLEM-SOLVING TYPE OF TEACHING EXERCISE

By JOHN H. WOODBURN

THE INTRODUCTION of more problem-solving type classroom experiences is a goal that is attracting the increased attention of science teachers today. This doubtlessly follows from the emphasis that is being placed on the importance of giving our students a genuine appreciation of the methods and procedures of scientists. Many teachers believe that such an appreciation can be developed only in classroom activities in which there exists a problem-solving atmosphere. How can this atmosphere be maintained? Our professional literature reports many instances of creative efforts to provide answers to this question. Such efforts have been, for the most part, directed toward one of three areas. (1) Attempts have been made to refurbish old or compose new textbook materials so as to emphasize the techniques and conditions which accompanied the acquisition of information. (2) Another group of creative individuals have made many modifications in the design and administration of laboratory activities with the intent of making them real problem-solving experiences. Finally, (3) many instructors have reported rather fruitful efforts designed to record evidence of student growth in problem-solving abilities. The quantity and quality of the research that has been done in these three areas is noteworthy.

There appears to be a minimum of reported attempts to prepare audio-visual aids so designed as to encourage the maintenance of a problem-solving atmosphere in the classroom. There is but a minimum number of current educational films and a few adaptations from theatrical productions that do anything more than merely announce and proclaim the results of scientific enterprises. The exceptions do portray selected scientific episodes rather well.[1] The author of this paper contends that the producers and, especially, the script writers of educational films can improve their product if they will give more attention to the methodology of science. Educational films could well include a description of the origin of hypotheses including some of those that turned out to be fruitless. In the films already available that do present the testing of hypotheses, the script could well emphasize much more clearly the design or strategy underlying the experimentation. Many students appear to be totally näive in sensing the strategy and limitations inherent in an experimental test of an hypothesis.

The second phase of the thesis that underlies this paper is directed toward classroom teachers. With a 35-mm. camera and a minimum amount of photographic experience, a teacher can provide himself with aids that are exceptionally useful in maintaining a problem-solving atmosphere. Much of this usefulness stems from the adaptability of the aid. Many teachers rightfully retain their own version of what are the methods and procedures of science. Some teachers deplore the identification of stereotyped steps while other equally sincere teachers think they can sense a definite procedural pattern in nearly every episode in science. The validity of either of these points of view is not the question here. The significant point is that either view is difficult to put into practice in the classroom without effective aids to learning. Students, in general, are not accustomed to approaching a topic in science with a problem-solving attitude. In some instances they actually resent having to "think their

[1] This has been a prime objective of the NSTA Motion Picture Committee in the teaching films they have excerpted thus far.

When he was on the staff of Michigan State College, Dr. Woodburn's responsibilities included the writing of examinations for the Physical Science and Biological Science Departments of the Basic College. A prime objective in both departments has been, and is, the attainment of instructional goals far beyond the mere acquisition of subject matter. (See "General Education in the Natural Sciences" by Chester A. Lawson in the March, 1953, issue of *TST*.)

This objective received very heavy attention in the examinations, of course, and John Woodburn has therefore had far more experience than most of us in the writing of suitable test items appropriate for this purpose. His article certainly will interest you if you employ the "problem-solving approach" in your teaching.

Assistant Professor of Science at Illinois State Normal University, Dr. Woodburn is currently on leave of absence and serving as Assistant Executive Secretary of NSTA (see page 191).

FIGURE 1. Do the three white puppies belong in this litter?

way out" of a perplexing and frustrating circumstance. Teachers who are trying to add the problem-solving type of activity to their repertoire need every aid to learning that is available or can be made available.

The first phase of this type of teaching involves getting a specific problem identified to the students or posed before them in a realistic and not too esoteric manner. The author was able to photograph a pair of pedigreed Boxer dogs and their litter which included three all-white or nearly all-white pups (Fig. 1.). The discrepancy between the coat color pattern of the parents and offspring immediately poses a problem before a group of students. A more esoteric example grew out of the generally accepted information that rose comb in chickens is dominant over the single-comb trait. An agriculture student obtained some single-comb hybrids from a cross between what he thought were purebred single-comb Leghorn hens and a Hamburg rooster. Photographs of these parents and their offspring provided slides which, combined with the textbook presentations, produced a perplexing situation.

In another case, the author photographed a sow with her litter of pigs (Fig. 2.). This slide immediately conflicts with the "like begets like" concept. Analysis of the facts evident in the slide and the consideration of conditions under which

FIGURE 2. If "like begets like", what must the male parent of these pigs have been like?

this litter was produced together with generally accepted facts concerning the inheritance of coat color in swine, duplicated with data-gathering phase so evident in many scientific episodes. These data practically lead the students to raise the question of whether or not the litter could have been sired by more than one male hog.

If an instructor chooses to present a more stereotyped interpretation of the methods of science, he can prepare such slides as are shown in figure 3. The complete series of these slides was designed with the single objective of portraying the basic strategy of analytical chemistry. Provision was

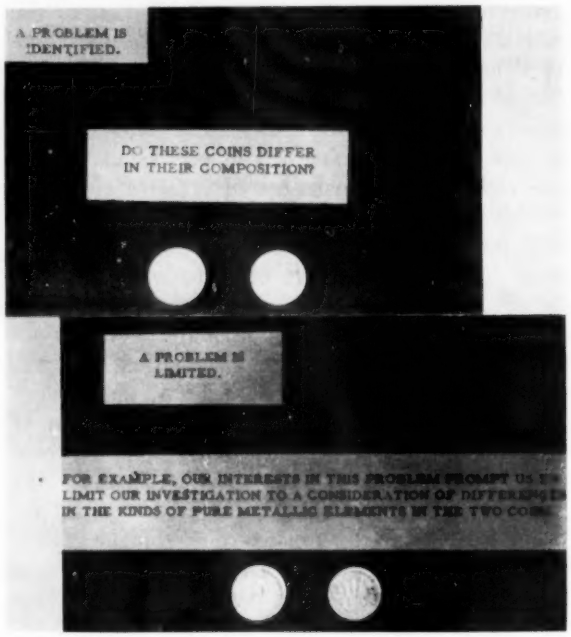

FIGURE 3. A problem in chemical analysis reduced to stereotyped "scientific method" steps

made for a minimum amount of student participation. The plans in connection with this series of slides include a second problem involving differences in the composition of two other coins that are almost identical in general appearances but differ in composition. Two references in the local library differ in regard to the nature of the metals used in the wartime Jefferson nickels. This apparent breakdown of the traditional "consultation of an authority" encourages the students to try another type of solution to the problem.

The 2 x 2 color slide is effective in aiding students to visualize the species and materials with which investigators have worked. The author has come to realize how little meaning bare words carry in attempting to describe Leghorn and White Silkie chickens to students from non-farm backgrounds. An understanding of the inhibitor gene effect as dis-

cussed in the textbook, however, hinged on the students' conceptions of these two breeds of chickens. Exhibitors at the local State Fair cooperated in making a slide available in which these two breeds can be compared (Fig. 4.).

The nature of the genes that are responsible for the transmission of flower color in four-o-clocks presents an exceptionally rich teaching situation when presented by means of 2 x 2 color slides. A slide was made which showed all of the data related to inbreeding each of the six phenotypes: red, white, yellow, pink, orange, and lemon. By carefully masking portions of the slides with opaque tape it was possible to dole out data to the class by revealing separate portions of the whole slide. This technique enabled the instructor's script to include such questions as—What is the most logical analysis of the results of this cross? What modifications should we now make in our tentative hypothesis in the light of these additional data?

Some of the desirable reality of slides of the actual materials used in the solution of a problem may be sacrificed at certain phases of the teaching exercise in order to save some of the time required to arrange the actual materials for satisfactory photography. The origin and testing of hypotheses may be portrayed by slides prepared from photographed diagrams and charts. Figure 5 shows such a slide. The problem that was involved here was sex-linkage as exemplified by the barred feather pattern in chickens. The slide shown in Figure 5 contains the gene symbols that were necessary to provide a logical observation of the crosses as diagrammed. Differences between poultry and human in respect to the transmission of the sex chromosomes create a good problem-solving situation. Given data related to the transmission of human color-blindness, students who have developed the sex-linked concept as exemplified in poultry should be able to sense the genetic pattern of inheritance of color blindness.

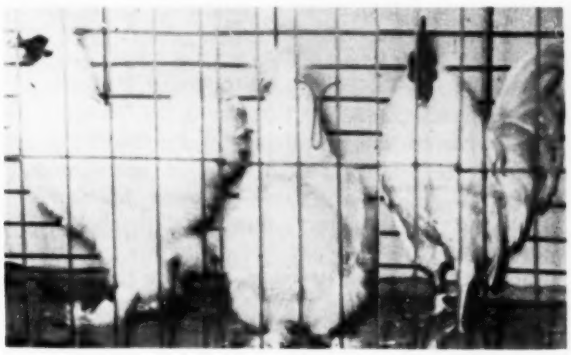

FIGURE 4. Silky versus normal feathers, yellow skin versus lead gray, and pea comb versus single comb

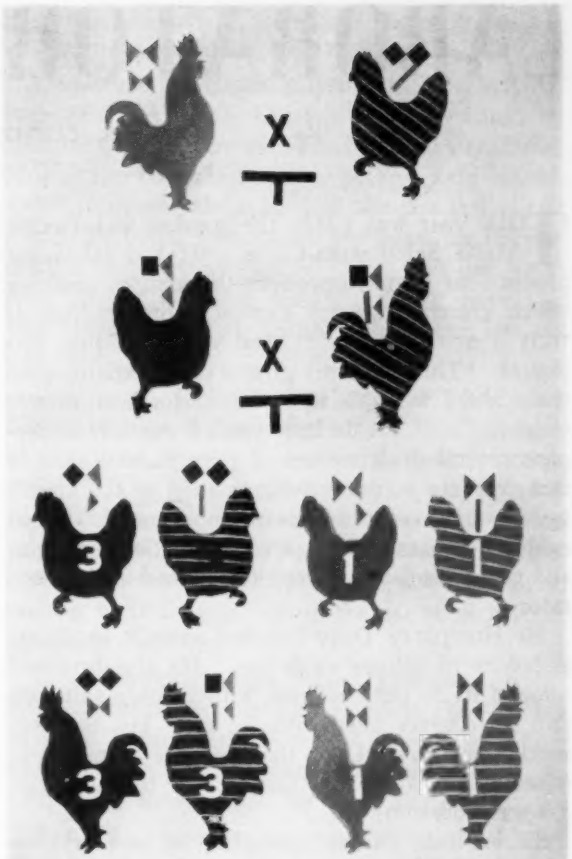

FIGURE 5. A genetics problem portrayed diagrammatically and the diagram reduced to a 2 x 2 color slide

If a science teacher stays alert to scientific enterprises being conducted in his community, quite often he is able to acquire especially useful 2 x 2 slides. As an example, the author was able to make a photographic record of a project in which colchicine was used to produce tetraploid watermelons which, in turn, were crossed with ordinary diploids to produce seedless fruit.

The author feels that he has but scratched the surface of the total contribution that audio-visual aids may make toward encouraging the problem-solving type of teaching exercise. Rather than having a film merely announce the volcanic origin of Crater Lake, would not the film be more valuable if it portrayed the precise observations that produced conflicting hypotheses and then followed through on an examination of evidence leading to the eventual elimination of one and the retention of another hypothesis? A film or series of 2 x 2 slides that portray the evolving identification of the relationship between plant auxins and phototropism could do much to illustrate in a genuine fashion how scientists work.

LABORATORY EVIDENCE

By B. CLIFFORD HENDRICKS

THE year was 1932; the speaker was Doctor Marie Sklodowska-Curie. "It had taken me almost four years to produce the kind of *evidence* which chemical science demands, that radium is truly a new element." [1] And what was that *evidence?* "This (radium) gives a characteristic spectrum, and I was able to determine for it an atomic weight. . . . . In later years I was able to prepare several decigrammes of pure radium salt, to make a more accurate determination of the atomic weight, and even to isolate the pure metal." That evidence—characteristic spectrum, atomic weight, and metal's isolation—were all attained in the laboratory.

Sir Humphrey Davy [2] placed animals in an atmosphere of nitrous oxide gas. He also breathed some of it; he put his hand, with an open skin cut, into a container filled with the gas. He, too, was seeking *evidence*. Upon that evidence he presently rejected Dr. Mitchell's theory that nitrous oxide gas was poisonous.

Sir William Ramsay thought [3] he had krypton in the sample he sent to Crookes to be analyzed. Crookes found the spectrum the same as Janssen had obtained for the sun-gas, helium. Crooke's evidence challenged Ramsay's classification. Ramsay might, with all propriety, have asked for a spectrum of the gas by another analyst. He knew that spectra are reproducible.

Thus, in the history of science, laboratory evidence has loomed large in the narrative. The distinctive quality of that evidence has been, ever, that it was objective, reproducible, and so not dependent upon the juggling of the meanings of words.

There has not been a sunset for laboratory *evidence;* it has not merely "strutted its tiny hour upon (history's) stage." Reflection readily recalls many current demands for its supporting service.

Court Evidence

An afternoon with the court reporter brings exhibit A from current events. "A teen-aged youngster peddling home on his bicycle at dusk was struck by a 'hit and run' driver and killed. Suspicion pointed to a wealthy society matron." [4] She reported she was in a nearby city at the time of the accident.

Dr. Wilmer Souder, Consultant, National Bureau of Standards, was secured as aid to getting the facts. "Scratches on the front of the mud guard of the suspected car, when carefully compared with the milled pattern of the adjusting cone on the bicycle fork, exactly matched the pattern. (This) cold scientific evidence withered the woman's alibi." Here law leaned upon laboratory evidence.

Weather-wise Evidence

It need not be that a Ph.D. or an M.D. needs or uncovers the evidence. This tale has to do with a plow-boy sweltering under an August sun. There was no apparent movement of air that day; he stopped his team each time around for a "breather".

B. Clifford Hendricks is one of the "names" in science education, particularly chemical education, through the years. Well-known as professor of chemistry at the University of Nebraska, where he obtained his Ph.D. in 1923, Dr. Hendricks always maintained a deep and inquiring interest in the teaching of science in the high schools.

Dr. Hendricks recently retired and since NSTA can't let that happen to such active minds, we wrote and asked him to consider writing a few "thoughts for the day" for our magazine. He did more than that, as a reading of his article will amply show. His discussion penetrates deep into the heart of why we teach science and his closing paragraph suggests a follow-up paper on "Laboratory Sensitivity."

Dr. Hendricks is now living in Longview, Washington; says he is busy "getting an operational blueprint for the status of 'Professor Emeritus.' This involves sociology, economics, psychology, and philosophy all imposed upon one's background of academic training. . . . One has to do it 'on his own'; the schools are too busy with 'youngsters' to give time to do much for the 'oldsters'."

[1] Curie, Marie, *Pierre Curie*. Pages 188-189. MacMillan Co., 1932.
[2] Kendall, James. *Young Chemists and Great Discoveries*. Pages 15-19. Appleton-Century. 1934.
[3] Weeks, Mary Elvira. *The Discovery of the Elements*. Pages 285-286. Mack Printing Co., Easton, Pa. 1933.
[4] Schurmacher, Emile C. "Washington's Detective X." *This Week Magazine*, Jan. 28, '51.

But mid-afternoon, almost as if by a miracle, the air "came to life" and from a new direction. In a matter of minutes humid heat gave way to temperature comfort. There was no further need for the "once-around" rest for the team. The chap on the plow seat, on the basis of his past interest in weather changes, mentally concluded, "That 'high' was pressing hard upon the 'low' before it."

But that inference was drawn from but two items of evidence; temperature drop and wind change. The plow-boy knew his evidence was lacking in adequate spread and in precision.

Some weeks later he visited the office of meteorologist Loveland at Lincoln, Nebraska. "Yes," said Mr. Loveland, "We have records of that day's weather change charted upon our maps." His assistant spread those sheets before the visitor. This time he had precision reports of temperature change, as well as wind direction and velocity. In addition there were the barographs and air humidity change as well. "That evidence clearly indicates that my first inference about that weather change was right," was the young farmer's mental conclusion as he left that office. He had sought and used, not exactly laboratory evidence, but certainly objective, widely acceptable evidence in his probe for an explanation of that August day's weather change.

Clinical Evidence

Mary Ellen was returning home with good news for her waiting brothers. How so? Her brief statement was, "The doctors say I can diet myself back to health." Homer and Dick wanted particulars. "They didn't tell me until they had made a thorough examination," was the next statement. "They took temperature, blood pressure and blood count, urine analysis, X rays of chest and of knee joints, cardiograph, and many other tests. Then they got their heads together and finally reported what they thought it all meant. What I was most interested in was what they thought I should do about it. I am to eat less meats and other foods that tend to produce uric acid." In the more precise language of science, these doctors of that clinic first needed all the evidence, mostly laboratory in source, before they were warranted in prescribing. Their success, in terms of Mary Ellen's health, was predicated upon skill in mapping a program of laboratory testing whose objective, measurable evidence would enable them to assess her needs.

Limitations of Evidence

Even though its current wide spread use is conceded there are limitations to its significance. Its importance should be recognized; however, its significance should not be over-rated.

Evidence is not necessarily proof. A recent Associated Press release had it, "New proof told for Einstein's famous theory. The National Geographic Society reported the news—(that) its field team—(in a study of) the eclipse of the sun last winter found the noted scientist on the beam, in his predictions thirty years ago." Those who use words with greater precision would certainly have said that it was new and additional *evidence* but not new proof.

It is said [1] that "As late as 1654 Archbishop Ussher of Ireland firmly announced that his study of Scripture *proved* that creation took place in 4004 B.C. on October 26 at 9 A.M." This, perhaps, represents an extreme of the non-technical use of the word proof. It is, however, capable of adding to the difficulties of the science teacher seeking to attain precision in the use of such terms as evidence and proof.

A widely used high school chemistry book [2] heads one of its sections with: "Proofs That Air Is a Mixture." An inventory of that which follows finds four concisely worded statements that present objective "Evidence That Air Is a Mixture."

Euclidian geometry has pretty firmly established the concept that there is that which is called proof. The experiment-using scientist, however, is a bit guarded in placing the label "proven" upon those generalizations based upon laboratory evidence. He is ever alert to the possibility that there may still be some adverse evidence not yet uncovered.

Evidence Sensitivity

Evidence has been, it seems, a major contributor to science's unfolding. It is a routine servant in many contemporary scientific procedures. Even so, there appears to be some confusion in regard to its correct significance judging from current reporting. Does this situation warrant an alerted attention by teachers of experimental sciences? Does it mean that student appreciation of the importance of experimental evidence is not realized by following the principle of concomitance? Has the time come for science to have an objective labelled "Evidence Sensitivity," analogous to "Social Sensitivity" as followed by teachers of the social studies?

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[1] Barnett, Lincoln. "The Earth Is Born." *Life*, Dec. 8, 1952.

[2] Weaver, E. C. and Foster, L. S. *Chemistry for Our Times*. Page 38. McGraw-Hill. New York. 1947.

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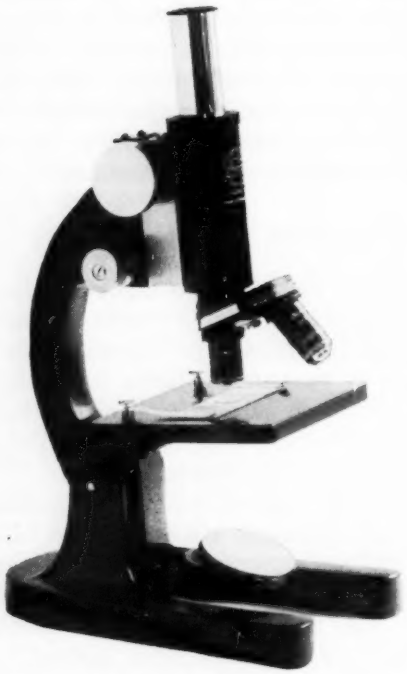

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SCIENCE TEACHERS FOR TOMORROW

By RAY C. MAUL

IS America about to run out of its supply of well-trained, resourceful leaders to carry on the future development of the technology on which our world leadership so largely depends? Perhaps not, but rapidly changing conditions carry an ominous warning; a careful look at the meaning of some of these changes is likely to bring us up short.

The onrush of American industrialization, the spread of American influence to every part of the globe, the assertion of our leadership, the acquiescence to this leadership throughout the free nations—the phenomenal rise of the United States in the last half century—all this can be traced directly to the prevalence of resourceful, thoroughly trained men and women of creative imagination. Scholars in the sciences have been, and are, the foundational stone in this structure. The scientist, possibly more than any other citizen, may point to the role of his predecessors in shaping the destiny of the nation, and in carving its present place among nations.

What is the most critical bottleneck, now and in prospect, in the pipeline that pours out the nation's supply of scientifically trained personnel? Ask different "manpower specialists" and you may get different answers. However, two years ago in one of the Edison Foundation Institutes for Science Teachers, its Executive Director, Admiral Harold G. Bowen, said that the high school science teacher was as pivotal in this problem as is the center on a football team.

Leaders in science education, particularly those responsible for NSTA's Future Scientists of America Foundation activities, are becoming increasingly concerned, even alarmed, at the prospects for a continuing supply of properly qualified science teachers. Some of the reasons for this concern are clearly set forth in this article by Dr. Ray C. Maul.

Dr. Maul is Assistant Director of the NEA Research Division. Formerly dean of State Teachers College, Emporia, Kansas, Dr. Maul came to NEA in 1950 as Research Associate of the Commission on Teacher Education and Professional Standards. Each year since then he has directed the annual study of teacher supply and demand. Probably there is no better informed man on this subject in America and we are indeed fortunate that he has had time to "give a look" at some of the facts regarding science teachers and to report to us by way of this article.

Whence Comes the Scientist?

American leadership in things scientific does not imply a native superiority just because one is born under Western skies, or of white skin. Our plentiful supply of inquisitive researchers, those who build the American "know-how," can be accounted for in easy, understandable language. Youngsters of superior native ability are given the opportunity to discover for themselves that ability (aptitude plus interest) in a way not provided by any other nation. It is through a free public school system, a system which keeps open the channels of exploration and self analysis for several years beyond the age at which youngsters in other countries are committed to vocations for life. At any given time we probably have not produced an unusually high percentage of youth with a scientific bent—but we have *identified* a larger percentage of these youth than any other nation. And having identified them, we have carried them on, with extended preparation, to a level of high scientific productivity. It has been a case of making greater utilization of our potential. This reservoir of talent, merged among all the youth of a given age, has been drawn to the surface in the schools which are staffed with teachers imbued with the spirit of discovery—the discovery of human beings capable of carrying on into the unknown the search for truth.

What Is the Teacher's Contribution?

All too little credit has reverted to the teacher. Beginning in the grades, and expanding through the junior and senior high school, it is the resourceful teacher who leads in the explorations, who opens

up the challenges, who recognizes the gleam of inspiration in the eye of the apt student. In thousands of cases it is the teacher who fans a spark into a flame of curiosity. Often it is touch-and-go with a student, whether he will follow up the first indications of an aptitude, or whether his energies will be dissipated elsewhere in interests of no more than passing substance. The teacher is literally the key to the situation during the formative years in which concepts are grasped, abilities are recognized, interests are formed, visions are caught, and future plans are made. The number and the quality of the scientists of tomorrow are being determined in the classrooms all across the nation today.

Only now is the public beginning to appreciate the vital nature of the teacher's role. This appreciation is fostered by the realization that, in the maelstrom of clashing ideologies, we are greatly outnumbered in the ongoing world struggle; that we must take stock of our sharply limited manpower and account for the utilization of every segment of it in each phase of our economic life. We are already at the end of the era in which we could afford to ignore this factor.

What about the Supply of Teachers?

If our schools are to become more efficient in identifying and encouraging youth with scientific aptitudes, then the schools must have a sufficient number of competent, well-prepared teachers to carry on this task which grows more complex day by day. The effective science teacher of today must be more broadly grounded, as well as more intensively trained. Teacher-education programs may well be the concern of every science teacher, but the total number available to staff the classrooms of the nation may rightly claim our first attention. While we sharpen our interest in the quality of teacher preparation we must brace ourselves to meet the impact of sheer numbers.

A look at this problem shows that the supply of new teachers *is falling sharply* at the very moment the number of children to be educated increases. If youngsters now about ready to enter junior high school are to have the inspiration of a competent science teacher—if the American school is to sift the high school population for the next decade so that every student with scientific aptitude is to be identified and encouraged—if we are to fortify our American society two, three, and four decades hence with leaders of resourcefulness, creative imagination, and a sound understanding of science—then we must reckon with the dwindling supply of qualified teacher candidates now trickling from the colleges. Moreover, this annual crop of college graduates must now be further divided to meet new demands for men, particularly college trained men.[1]

Supply Trends Are Sharply Down

Candidates for teaching positions come from several sources. Former teachers return to the classroom; college graduates, after experience in another occupation, turn to teaching; college graduates not prepared to teach are sometimes given emergency, short-term certificates. By all odds, however, the one dependable source of supply is to be found in the college graduating class. It must be recognized, also, that this latter group is the only source of supply that can be accurately measured.

For the past several years the annual national teacher supply and demand report has contained *complete* figures concerning the number of college seniors who, at the end of the academic year, would graduate with satisfactory preparation for teaching, according to the certificate requirements of the state in which the college is located. These reports, when considered from year to year, give an accurate picture of the number of *new* candidates in each teaching field who will be regularly eligible for employment as teachers for the school year starting in September following their graduation. It must be noted here that these figures show the total number of college graduates *who are eligible* to apply for teaching; it must not be assumed that this is the number *who do apply*. Obviously, many of these college graduates who are qualified for teaching certificates will not choose to seek teaching positions. In mathematics about one-third of the group, and in the various sciences about one-fourth of the group, are women, many of whom may be expected to become homemakers and not seek gainful employment. Many of the men may be expected to enter the armed services immediately after graduation. Many of the others of both sexes may be expected to enter other occupations for which their college preparation fits them. Thus this annual report from the colleges must be discounted when the new "supply" of candidates is considered. The reported number is always higher than the number who actually enter teaching.

The accompanying table shows that the trend is down in the annual production of qualified candidates to teach the various high school subjects. The trend is down more sharply in the production of qualified mathematics-teacher candidates, and

[1] For further discussion of this point see Maul, Ray C. "Are Schools Losing the 'Man' in their Manpower?" *School and Society*; 77: p. 369, June 13, 1953.

Total Number of College Graduates, Number Prepared to Teach in High School, Number Prepared to Teach Mathematics, Number Prepared to Teach Science, With Percent of Year-by-Year Changes Since 1950

Year	Total bachelor's-degree graduates	Percent change from 1950	Total graduates prepared to teach in high school	Percent change from 1950	Total graduates prepared to teach mathematics	Percent change from 1950	Total graduates prepared to teach					Percent change from 1950
							General Science	Biology	Chemistry	Physics	Total	
1	2	3	4	5	6	7	8	9	10	11	12	13
1950	433,734	.....	86,890	.....	4,618	.....	3,009	3,473	1,660	954	9,096	.....
1951	384,353	−11.4%	73,015	−16.0%	4,118	−10.8%	2,772	2,815	1,342	578	7,507	−17.5%
1952	331,942	−23.5	61,510	−29.2	3,142	−32.0	2,216	1,995	842	373	5,426	−40.3
1953	.....	.....	55,468	−36.2	2,710	−41.3	1,796	1,830	722	317	4,665	−48.7

Source: Figures in column 2 were taken from Story, Robert C. *Earned Degrees Conferred by Higher Educational Institutions, 1952-52.* Circular 360a. December 1952. U. S. Office of Education, Federal Security Agency. All other basic figures were taken from annual NEA reports on teacher supply and demand.

the trend is down most sharply in the production of qualified science-teacher candidates. These latter figures may well be cause for genuine concern, particularly among those who have prime responsibility for the long-range educational program of the nation.

The year 1950 marked the greatest production of college graduates in any one year in our history. Some 433,000 persons received bachelor's degrees that year. Of this number, almost 87,000 were prepared to teach some subject in the high school curriculum; this is the number who included in their college programs the prescribed professional courses entitling them to high school teaching certificates. Some 4,600 of these potential high school teachers were mathematics majors, and some 9,100 of them were science majors. These graduates constituted the available "supply" for the school year beginning in September, 1950. It can be clearly recalled that there was absolutely no "oversupply" of candidates for either mathematics or science teaching positions at that time. In other words, the schools needed all of his annual crop who wished to teach.

Since 1950 three new factors demand attention. First, the draft has been resumed, and it now appears probable that America will be required to maintain an armed force of some 3,000,000 men on into the indefinite future. Since the two-thirds of the potential mathematics-teacher candidates and three-fourths of the potential science-teacher candidates are men, the call to military service can completely upset the balance between supply and demand, if such balance existed in 1950.

Second, an enormous increase in the total number of high school students to be educated is just around the corner. For nearly two decades, the high school enrollment has been stable; the figures of a given year have not exceeded those of the previous year. Soon, however, the avalanche will come. In 1960 there will be three high school students for each two in 1950. This is a 50% increase in a single decade. We are already three years into that decade, and four years (or more) are required to produce a teacher after the would-be candidate graduates from high school.

Third, the potential supply of teachers has dropped alarmingly since the high of 1950. The total number of potential high school teachers to come from the colleges in 1953 is down 36.2%; the total number of potential mathematics teachers is down 41.3%; *the total number of potential science teachers is down 48.7%!*

Where Will Tomorrow's Scientists Come From?

The role of the school in identifying and encouraging students with aptitude for any scholarly effort need not be argued. In science this responsibility is fundamental. It can only be accomplished by a staff of thoroughly competent teachers. The question of tomorrow's scientists is, in the final analysis, dependent upon the answer to the question, "Where will tomorrow's science teachers come from?"

Is it fair to say that the National Science Teachers Association has the most vital stake in this issue?

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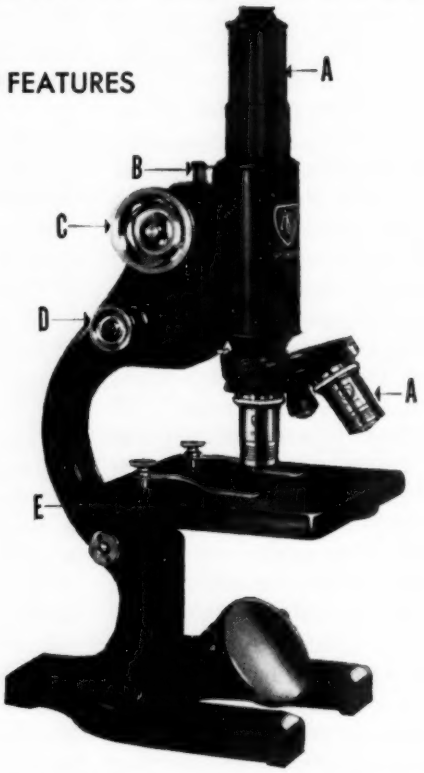

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Classroom Ideas

College Level

Ask the Biologist

By RICHARD R. ARMACOST
Associate Professor of Biological Education
Purdue University, Lafayette, Indiana

Most of the Purdue University staff members in the Department of Biological Sciences are not primarily or directly working in the field of high school education. This is also true of other biological science faculties at most universities and colleges. It is realized that high schools are important links in the educational system, but staff members have been hired for positions which emphasize other activities and give priority to other responsibilities.

To coordinate services to the schools, there has been established at Purdue a dual professor system whereby certain professors are members of both the School of Science and the Division of Education. These representatives of the University cooperatively and directly work with the high schools of Indiana, providing various types of services and aids to high school science teachers and their students. A weekly, taped radio program, "Ask the Biologist," is one of these services.

The Purdue University Department of Biological Sciences sponsors "Ask the Biologist" as a means of taking many members of its staff to the high schools of Indiana. This series consists mainly of question-and-answer broadcasts and interviews centered around biology topics of interest to high school students and their teachers. No speeches are given, and a valiant effort is made to present material in such a way that it is understandable, educational, and enjoyable. Outstanding Purdue University scientists, high school teachers and administrators, and high school students with particular science aptitudes appear on the various programs.

Representative programs have been developed around such stimulating topics as: Why Study Biology; Insects; A Successful Biology Project; Understanding Heredity; Your Inheritance; Fish and Fishing; Biology as a Vocation; Gardening; Bacteria; Animals Without Backbones; Animals with Backbones; Sound Conservation Practices; Reproduction; Color in Plants and Animals; Photosynthesis; Hunters and Hunted; Dormancy and Hibernation; How a Scientist Works; Conduction in Plants; Circulation of Blood in Man; Hormones; Antibiotics; Mineral Nutrition; House Plants; Life in a Pond; Cultivated Flowers; Poisonous Plants and Animals; and others.

Since all prospective listeners cannot be available for a radio program at any given time, it is important to provide tapes of all broadcasts for schools which desire them. This also permits a teacher to fit the various programs into his course at a time when he thinks they will be most effective. Tape libraries can be developed in high schools and used from year to year.

Broadcasts and tapes of "Ask the Biologist" are meant to *supplement* teaching, not supplant it. Many questions are answered that do not appear in textbooks. Students get a personal degree of satisfaction by having questions which they send in answered on the air. The staff of the Purdue University Department of Biological Sciences is of the opinion that "Ask the Biologist" can be a means of contributing many fine ideas, and for that matter inspiration, to biology students and teachers of Indiana high schools. The radio audience is also given at least a listening acquaintance with many eminent biological scientists who might never have time to accept the opportunity to visit many of the schools participating in the radio series.

The author (at right) interviews Dr. John S. Karling, Head of the Department of Biological Sciences, and Dr. Henry Koffler, Research Bacteriologist, both from Purdue University. The topic is "How a Scientist Works" and involves a discussion of the scientific method.

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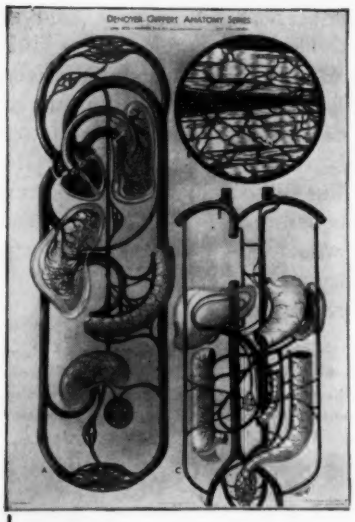

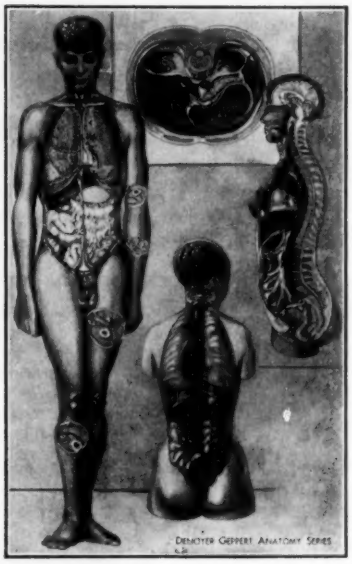

Illustrated above in miniature are charts KL4, KL6, and KL8 (l. to r.) from the Kampmeier-Lariviere Functional Human Anatomy Series published by Denoyer-Geppert Company. Each one of the ten charts in the series is a masterpiece of anatomical art, presenting its subject matter in a modern way for modern teachers and students. For complete information about these charts, write to:

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Elementary Science

Tanks and Gadgets from Glass Bottles

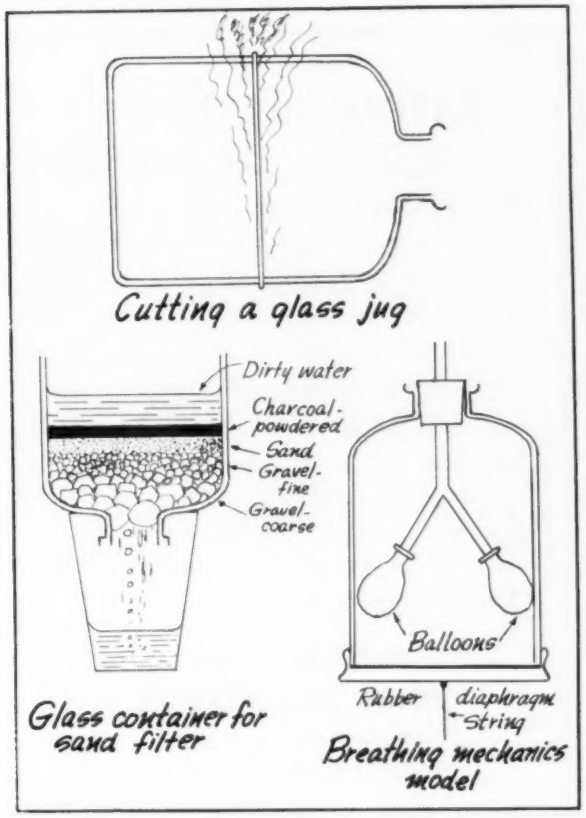
By EVAN C. RICHARDSON, Science Department
State Teachers College, Newark, New Jersey

Although the kerosene-burning string method of "cutting" glass bottles is known to many science teachers, perhaps it will be new to enough others to justify a brief article about it. My students have made more than a hundred glass tanks and other gadgets this way in the past few years and they continually think up new uses for them.

The mechanics of cutting a bottle are simple and are effective with many shapes of bottles. We advise a cylindrical type, however, because the fracture at the desired level occurs more cleanly. The accompanying sketch reveals how the steps are involved.

(1) A gallon glass jug, for example, is tightly wound with cord, string, or heavy twine adjusted to the level of the desired fracture.

(2) Soak the string with a liquid fuel such as kerosene, turpentine, alcohol, or the like (but *not* gasoline because of the lead it contains). It is convenient to daub the fuel onto the string by using a small paint brush.



(3) Hold the jug in the "lying" position and safely distant from your clothing and touch a lighted match to the string. The fire should burn for half a minute or so. If alcohol is used the fire may not burn this long; in which case daub on some more fuel and light it again. While the fire is burning, keep rotating the glass bottle so that all sides will be heated.

(4) A quick dip of the spot-heated glass bottle into running water or a tank of water will usually suffice to produce a clean fracture of the glass at the desired level. If you have two or three failures, do not give up; adjust your procedures and try again.

(5) The sharp edges and splinters of glass should be removed. This can be done with coarse emery cloth or sandpaper or by striking the edges of the glass with light, glancing strokes of a piece of heavy wire gauze (the kind found in the high school chemistry laboratory for supporting objects being heated over the Bunsen burner). This step is essential for safety's sake.

(6) Reinforce the edges of the cut sections by covering with adhesive tape or electrician's tape (tire tape).

Gadgety uses of cut bottles might include: (a) a vivarium for insect life; (b) a funnel for pouring; (c) a filter for water purification; (d) the "chest" for demonstrating the mechanics of breathing. Some of these are shown in the drawing.

Biology

An Antibiotic Display

By HERBERT DRAPKIN, Department of Biology and General Science, William Cullen Bryant High School, Long Island City, N. Y.

An effective way to introduce the idea of antibiotics in connection with the study of Health and Disease is to have a student-constructed display of empty antibiotic containers. The jars or other receptacles are wired to a sheet of heavy cardboard and sufficient space is provided for large hand-printed names of the antibiotics. Mention of several diseases checked by each antibiotic may also be printed underneath the container.

I have tried this procedure for several years in my classes and the reception by the pupils has

been gratifying. There have always been several pupils in each class who knew a pharmacist who could provide them with the necessary containers. Other pupils have been able to contact doctors who have also provided them with illustrated pamphlets as well as the treasured empty container. The pupils interviewed these persons and obtained comments on the uses of antibiotics.

Interesting consequences have resulted from these displays. One enterprising lad obtained first-hand information for his report on the high cost of antibiotics by interviewing an official of a leading pharmaceutical company, as well as his local druggist, his physician, and several scientists in a hospital research laboratory.

Physics—Electricity

Fuse Those Meters

By CHARLES L. SKOEPOL, Science Instructor
Crete High School, Crete, Nebraska

For a number of years I worried myself silly for fear our students in physics and general science would burn out our electric meters, each one carrying a price tag of from $15 to $25. It never happened to a student, but one day *I* burned out our voltohmmeter in a demonstration! The school board did not complain about the $15 repair bill, but my students lost a month's use of the most useful instrument in the laboratory right when we needed it most. I decided this would not happen again.

I calculated the current ratings of the meters (the easy ones) myself and had a fellow member of our local "ham" radio club help me calculate the tougher ones. I purchased (with school funds) and installed (on my own time) the necessary type 3AG and 8AG Littlefuse instrument fuses and fuse clips to protect our $235 investment in electrical measuring instruments.

Result: Now I can relax when we have electrical and radio laboratory sessions. All I have to do is say, "Look, students, you can do anything you want to these meters except drop them or hit them with a hammer. Fuses cost 10 cents each." Now we have much more laboratory work (in small groups) and fewer demonstrations (that the students in the back row can't see!). If I didn't enjoy teaching science so much I think I'd set up a national meter-fusing service for high schools.

General

Getting Acquainted with Your Students

By MILAN J. KRASNICAN
Science Consultant, Alliance, Ohio, Public Schools

One of the difficult problems confronting the science teacher is that of getting acquainted with the students, particularly at the beginning of the school year. Many teachers have five or six classes to meet each school day. This may mean getting to know perhaps 150 youngsters in a short time.

One technique which has been helpful is based on the use of pupil-information cards 3x5 inches in size (see below).

1. Name	2. Age Sex
3. Extra-Curricular Activities	4. Class
5. Hobbies	6. Why taking course?
7. Expected work after graduation	8. Expect to go to College?
9. Part-time job?	10. Other current courses:

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On the first day of class, along with book distribution and preliminary instructions, students are asked to fill out the cards. Thus, in a few minutes, a teacher may have some interesting data which can be used to advantage in planning classwork, getting acquainted with students, and discovering the background of a given class. A predominant group interest in a number of areas may alert the teacher to splendid opportunities in guiding the class program. Filed, the cards can become the basis for brief anecdotal records. Such a pupil-information file can become a handy tool in the improvement of science instruction by enabling the teacher to get acquainted with students in a simple, rapid, and direct manner. Projects, activities, and reading may be designed to meet, in part, the expressed interests and aims of students.

The tabulation that follows presents a summary of data secured on cards from a recent physics class.

Summary of Results of Pupil-Information Cards

Item	Number of Students
1. Number in Class	29
2. Student Age	
15 years	3
16 years	16
17 years	9
20 years	1
Sex	
Male	25
Female	4
3. Participation in Extra-Curricular Activities	
Hi-Y Club	9
Science Club	9
Band or Music	8
Booster Club	3
Y-Teens Club	3
Student Activities Council	2
Sports	2
Spanish Club	2
Fine Arts Club	1
4. School Class	
Senior	12
Junior	17
5. Students Having Hobbies	
Sports	15
Photography	6
Model Building	6
Radio, Electricity	5
Aviation	3
Reading	2
Animals	2
Collecting stamps, coins	2
Autos	1
Music	1
6. Why Taking Course?	
Interest in Science	7
Learn about Physics	7
College Preparation	15
7. Expected Work after Graduation?	
Engineering	10
Uncertain	6
Science	5
Nursing	3
Drafting	1
Farming	1
Pharmacy	1
Veterinarian	1
Music	1
8. Going to College?	
Yes	26
No	3
9. Part-time Job?	
Yes	18
No	11

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SYMPOSIUM—continued from page 163

Bryan F. Swan of the Laboratory School, University of Chicago, discovers "specialized interests." Here is what he has to say on this subject.

"Probably the most important consideration in dealing with the rapid learner is that the general laws of learning formulated by psychologists and educational psychologists are as applicable to the rapid learner as they are to the slower learner. This does not mean that the characteristics of the two groups are the same. It is well known, for example, that the rapid learner gets the idea more quickly and retains it longer; therefore the timing and amount of drill is different for the rapid learner. The rapid learner can assimilate more ideas and more complex ideas than the average or slow learner. The rapid learner is more curious and has broader interests and therefore sees more possibilities in a given situation. The rapid learner is more creative.

"The few characteristics reviewed give clues as to techniques that may be successfully used. Given a whole class of equally rapid learners the problem would be clear. Since this is rarely, if ever, the case the problem becomes one of providing for the more rapid learners without pushing the less able members too fast and without destroying group morale. This problem is made more complex by the difference in science knowledge and interest background of the students that come to us.

"One technique I have used to discover specialized interests as well as to provide additional experiences for the rapid learner I call 'Science Forum.' It is really an adaptation of the 'Show and Tell' period used by so many primary teachers. Each class is organized by electing an executive committee of three members who take turns being chairman and recorder. The purpose of Science Forum is explained by the teacher as well as the method of rewarding contributions. The contributions may consist of observations in the natural environment, questions that have puzzled them, reports of news events, reports of science projects carried on out of school, and the like. Science Forum is convened by the chairman at the beginning of the period and lasts for ten minutes if there are contributions. Contributions may be spontaneous or the program may be planned in advance. Spontaneous reports often arouse interest which results in a planned program for a later date.

"Science Forum does more than provide additional experiences and stimulation for the rapid learners. It helps them (and the teacher) keep up with science news. It helps the group get acquainted with each other. It provides a place for each person to contribute according to his special interests. It may provide the stimulus for a new unit. It may result in assembly programs.

"It might be well to mention that Science Forum requires some stimulation by the teacher. Once started it may well become self-perpetuating but usually it needs to have a 'shot in the arm' occasionally. The necessity of some method of rewarding contributions deserves reiteration. The teacher can make notations in a notebook specially provided for the purpose. Another way is to provide a spiral notebook with a page for each student. When the student makes a special contribution to Science Forum or to class he makes a record of it on his page and asks the teacher to initial it.

"While it is true that rapid learners enjoy Science Forum more than slower learners both make contributions and derive some benefit from it. For example, I recall the case of a student whose persuasive aptitude exceeded his science aptitude. He got himself elected chairman and then proceeded to make every session of Science Forum a lively affair. By contacting individuals he found out their interests and persuaded them to volunteer for

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a contribution. At the end of each week he would then plan a program on the topics previously arranged for the next week. Spontaneous reports were still encouraged but there was a definite agenda for each day in addition.

"Another kind of experience which the rapid learner enjoys is to plan and carry out his own experiment. Special interests may be discovered from Science Forum contributions or from questions raised during regular discussion. With a minimum of structuring the rapid learner is able to formulate hypotheses, choose the one most likely to yield results, design an experiment or experiments to test the hypotheses, collect the data, and draw conclusions from the data. He may then report his methods and findings to the group. If the experiment grew out of class discussion this report can be a very satisfying experience for both the experimenter and the group.

"The problem of providing the optimum amount of drill for both the rapid learner and the slower learner is real to all teachers. The multipath method is not desirable because it splits the group and tends to destroy group morale. The single path method leaves the rapid learner to do chores or unduly presses the slower learner if the pace is geared to the rapid learner. It is usually better to set up a common body of materials and activities as the core required of all. Additional activities are then planned to provide the extra drill. The slower learner will usually choose the drill type of activity while the rapid learner will choose the kind of activity that is actually an extension of the unit, that is, more knowledge, or he will choose a creative activity. In this way they learn to evaluate their learning habits especially as to the amount and kind of work they need to do to reach the goal. They also learn to take responsibility for their own learning and study habits."

Dr. Alexander Efron, Stuyvesant High School, New York City, delves into the problem of providing for the rapid learner at a science-oriented high school.

"The problem of educating the gifted science pupil, as it confronts us here at Stuyvesant, must be viewed against the background of the school as a whole which, from its very inception a half-century ago, has been dedicated to the training of science-oriented boys. The particularly talented science pupil, here to be described, is among the best of the many who have certain science interests and mathematical aptitudes in common but whose capacities for creative science thinking differ greatly. Thus a *double selection* must be put into effect before the unusually promising youngster is identified and placed in a learning situation where his potentialities can be fully developed. Accordingly, we find our best science clientele in the physics II honors class, the class in experimental and research physics, and, in the mathematics department, in the class in differential and integral calculus.

"It must be noted that *all* Stuyvesant students are required to complete a year of physics, a year of chemistry, and two years of mathematics (along with other requirements for the academic college-preparatory course). Many go on with science electives, such as courses in introductory engineering and electronics. A large number pursue their mathematics through intermediate algebra and trigonometry. It is, however, the most analytical, original, and creative type of student who is singled out for special college-level instruction, his intellect and imagination insuring success in advanced science work. Yet mere selection and segregation in special classes is not enough. The teachers of the singularly gifted students must rise to the heavy demands placed upon them and give of themselves lavishly and generously. ***Bright boys are not easy to teach.*** They ask for and must receive an enriched and penetrating treatment of the subject. In return, they enrich and inspire the teacher who is privileged to work with them.

"Let me illustrate this by reference to the physics course. In our organization of the subject, we follow the so-called 'spiral' program which affords the beginner an overview of the entire field of secondary-school physics, with the emphasis placed mainly on the qualitative and descriptive features of the course. Physics II students are then returned to the topics previously presented in physics I in a semi-rigorous exploratory fashion, although with its full complement of demonstration and laboratory experiments. The treatment now becomes more mathematical, many more problems are solved, and certain formulas and relationships are derived with the class. The 'second look' reveals much of what had been 'missed' before. Thus, as the student matures, his study of physics grows progressively more mature as well.

"The physics II honors class, made up of boys with an average of 90% or over in physics I and comparable grades in mathematics, English, social studies, and foreign languages, pursues the same course but with a large number of 'extras' added and with the level of instruction decidedly higher than that prescribed for regular physics II classes. The teacher now makes full use of trigonometry, graphical and algebraic analysis, logarithms, exponential methods of expressing very large or very small numbers, gravitational and absolute units (among the latter, the new MKS units), etc. The

subject is presented on a truly mature collegiate level, including some of the newer concepts and semantics of modern physics. We supplement the parallelogram method of combining vectors by the triangle and polygon methods as well as by trigonometric calculation. We teach the boys to resolve vectors in terms of sines and cosines. We show that loudness is a psycho-physical entity bearing a relationship to the logarithm of the ratio of two intensities. We explain that the familiar unit of illuminance, namely, the foot-candle may also be expressed as a lumen per square foot. We no longer 'picture' electric potentials as 'something like' a head of water, abandoning this time-worn analogy in favor of the more satisfying 'joule-per-coulomb' concept. Thus voltage is presented to our boys as a unit potential energy rather than something to be measured in some equivalent of 'pounds-per-square inch.' The lens formula (for thin lenses) is derived and applied to a variety of optical situations. The above are only a few examples of subject-matter enrichment. Many more occur in practice.

"The science-writing aspect of the course receives attention as well. Our best boys are familiar with the works of Eddington, Jeans, Huxley, Tyndall, Bragg, Hoyle, and other British exponents of lucid scientific prose. They have also read books by Selig Hecht, George Gamow, and the popularizations by Lincoln Barnett. As part of the course, they are asked to submit some half-dozen papers, carefully typed and neatly illustrated, dealing with a number of phenomena of general or special interest. They write on Ultrasonics, the Optics of the Compound Microscope, Microwaves, High and Low Temperatures, High Vacua, Color Photography, New Trends in Illumination, etc. Their papers are examined for scientific accuracy as well as for the quality of the prose employed. The best essays are read aloud in class.

"We travel a great deal, too, visiting various 'Open Houses' in the metropolitan colleges, attending special lectures and talks, visiting expositions and power plants, etc. The boys are constantly advised to collect technical literature, purchase as many books as their limited budgets will allow, in short, learn to 'dig things out' for themselves. We emphasize self-propulsion and sustained effort. Additional 'turns of the spiral' await those who wish to go further. All we can do is to reveal the beauty and splendor of physics. The final 'horizon' is of course never reached.

"The course in experimental and research physics affords our gifted science students still another opportunity for creative science work. A group of some 20 to 25 boys, carefully selected from the best physics II students (usually those previously enrolled in the physics II honors class), is given training in the performance of certain classical experiments in advanced physics and later guided in original research and investigation. Students in this class perform experiments with X-ray diffraction, measure wavelengths of light, set up lecher systems for determining the lengths of radio waves, produce and measure high vacua, learn to handle an oscilloscope, carry out experiments with dry-disk rectifiers and transistors, etc. They do the necessary reading, plan their attack, conduct the necessary experiments, and submit reports which are often models of completeness and elegance of exposition. Some of these reports are found worthy of publication. Some are submitted in connection with the Westinghouse Science Talent Search. All are marked by seriousness of purpose and maturity of approach.

"There is no easy way of discovering and educating our future scientists. They must be given every opportunity for conducting their own investigations. The Physics Department assigns most of its allotted funds to these special courses and counts the money well spent. Spectroscopes, oscilloscopes, cloud chambers, Geiger counters, diffraction gratings, mercury-vapor pumps, and other research tools must be freely provided if actual first-hand science experiences are to be made possible. Just as often, however, attention will turn to things purely abstract and mathematical, in which case paper-and-pencil techniques will be found adequate. Thus, theories of infinity, the study of fields, vector and tensor treatments of certain physical relationships, have been pursued by some boys with equally pronounced success. Whatever the investigation, it is the freshness of approach, the originality of method, and the maturity of thought which we value in our gifted youngsters. And, if they win prizes, are accepted by the best colleges, and achieve distinction in later life, may I, for one, say that they fully deserve the honor."

This symposium will be continued in the October issue and concluded in the November issue of *The Science Teacher*. We are planning to reprint under one cover, this symposium and other related articles that have appeared in *TST*. Please let us know whether you think this seems like a good idea.

NSTA Activities

Rocky Mountain Regional Conference Set for October 8-10

"Go west, young man (and woman), go west"; and if you're already out west, stay there—if you want to attend one of the meatiest science teaching conferences ever planned for that region.

Colorado University at Boulder will be host to the conference. Sessions will meet in the new three-million-dollar University Memorial Center. Boulder hotels, motels, and other housing facilities have already been reserved to accommodate the attendants at reasonable cost. To make reservations, write to Dr. Stanley B. Brown, University of Colorado, Boulder, Colorado.

Members and non-members of NSTA are equally welcome to attend the conference, and every school system in the region is urged to send representatives from both elementary and high school levels. A special invitation to attend is extended to all persons engaged in teacher education in science and to their graduate and undergraduate students. Registration fee for the conference is $1.00 per person.

The practical nature of the conference is implied in its theme, "Improving the Science Program in Elementary and Secondary Schools." Program sessions will offer talent of regional and national repute in science teaching. There will be an exhibit of commercial and educational teaching aids for science. Ample time and opportunities for social activities are being provided.

Teachers in the region (and beyond) are especially invited to bring or send science teaching displays and to offer to participate as consultants in the discussion groups or to prepare "Here's How I Do It" demonstrations not exceeding fifteen minutes. To volunteer, or to request an NSTA letter to your principal or superintendent that may help you be released to attend the conference, write to NSTA Executive Secretary, Robert H. Carleton, 1201 Sixteenth St., N. W., Washington 6, D. C. You can lend further support to the conference by taking time to write to five of your science-teacher friends, telling them about the conference and urging their attendance. The critical importance of good science teaching today throughout all the grades from one through twelve deserves, even demands, such action.

The conference program is as follows:

OCTOBER 8, THURSDAY

5:30 p.m. Rocky Mountain Steak Fry (planned for science teacher association leaders, representatives of state departments of education, NSTA state and area directors, and others who are interested; advance reservation required; write to the Executive Secretary)

7:00 p.m. Round-the-camp-fire conference: "Problems of Professional Participation by Science Teachers"

OCTOBER 9, FRIDAY

8:00 a.m. Registration opens

8:00 a.m. Exhibits open

9:00 a.m. Conference opens

9:30 a.m. Morning Session

1. The Science Program at the Elementary School Level
2. The Science Program at the Secondary School Level
3. Implications for Teacher Education in Science

11:00 a.m. Time to visit exhibits and University of Colorado science department displays (biology, chemistry, physics, geology, engineering, planetarium, etc.)

12:30 p.m. Luncheon ($1.75)—seating by "special-interest" areas (elementary, general science, biology, chemistry, etc.)

2:00 p.m. Afternoon Session; discussion groups: "Improving Science Instruction"

1. At the Elementary School Level
2. In General Science
3. In Secondary School Biological Sciences
4. In Secondary School Physical Sciences
5. Through Audio-Visual Aids
6. Through Teacher Education in Science
7. Through Business-Industry-Science Teaching Relations

3:30 p.m. Time to visit exhibits and University of Colorado science department displays

6:30 p.m. Evening Session

1. Dinner ($3.00)
2. Speaker—"A Report From a Frontier of Scientific Research"
3. Entertainment and mixer

OCTOBER 10, SATURDAY

8:00 a.m. Registration, continued

8:00 a.m. Exhibits open

9:30 a.m. Morning Session: "Reports From Inside NSTA"

1. NSTA Policies and Goals
2. Business - Industry - Science Teaching relations
3. The Association's journal, *The Science Teacher*
4. Future Scientists of America Foundation

10:30 a.m. Parallel Sessions: (a) Elementary, (b) Secondary: "Critical Problems in Building a Sound Science Program"; panel discussions

1. Adequate Time and Facilities
2. Integration and Social Implications
3. Keeping Abreast of New Developments in (a) education and related fields, (b) science

12:00 noon Lunch ($1.75)

1:30 p.m. Afternoon Session; parallel groups, (a) Elementary, (b) Secondary: "Here's How I Do It"; a series of science teaching demonstrations

3:00 p.m. Conference closes

The committee for the Colorado conference is headed by Stanley B. Brown, Assistant Professor of Education at the University of Colorado (and Life Member of NSTA). Dr. Brown has taught at elementary, secondary, and university levels. He obtained his Doctor's degree from Stanford University, has published numerous magazine articles and is co-author with Dean Guy D. McGrath, Arizona State College, of the forthcoming text, *The Teaching Of Science in Secondary Schools.* Other members of the general planning committee are as follows: Dr. Harold Anderson, University of Colorado; Dr. Sam Blanc, East High School, Denver; Dr. Donald Decker, Colorado State College of Education, Greeley; Mrs. Margaret Juchem, Colorado State Department of Education, Denver; Mrs. Helen D. MacCracken, Estes Park; Mr. William Walsh, University of Colorado; Dr. Paul Wilkinson, Manual High School, Denver; and Charlotte L. Grant and Robert H. Carleton, President and Executive Secretary, respectively, of NSTA.

▶ *1953 Report* of the Executive Secretary

"To Members of the Board of Directors, National Science Teachers Association: The fiscal and operational year just closed (May 31, 1953) has set another high-water mark in the extension of NSTA services and influence and in strides toward the attainment of our basic objectives. Those who have shared in making these gains possible may rightly share in the feeling of pride of accomplishment. This group of "sharers" would include our officers and directors, our dozens of committee members, nearly two hundred state and area directors, many of our more than fifty affiliated groups, our advertisers and Packet Service participants, our many friends and cooperators among educational, scientific, engineering, and business-industry groups, and our thousands of members and subscribers.

"To illustrate the strides made during 1952-53, we might recount briefly the history of a few activities:

1. First exploration of national convention facilities in Pittsburgh was made on May 2, 1952. Eleven months later the first national convention of NSTA was history—with 614 registered attendants from 34 states, 31 commercial exhibits, 270 program and committee participants, and other features.

2. In mid-April of 1952, the idea of an NSTA publication in science for elementary school teachers was approved. The elementary science committee accepted the challenge and went to work. One year later, the *Elementary School Science Bulletin* had gone through six issues. At least 10,000 copies of each issue were printed and distributed to teachers in more than six hundred schools across the country.

3. The first "high-level" conference on the proposed Future Scientists of America Foundation was held on March 19, 1952. The plan matured and was approved by the Board last summer at the Ann Arbor meeting. An Administrative Committee was appointed and held its first meeting last September. As of May 31, 1953, 28 organizations have contributed nearly $15,000 for the development and general support of FSAF; the Foundation objectives have been endorsed by such groups as the Engineering Manpower Commission of Engineers Joint Council, the Scientific Manpower Commission, the Manufacturing Chemists' Association, the Federation of American Societies for Experimental Biology, the U. S. Atomic Energy Commission, and others; a research study has been launched; an office secretary has been employed and an Assistant Executive Secretary to assume chief responsibility for the FSAF program will join our staff late in August.

4. The first annual program of Science Achievement Awards for Students, sponsored by the American Society for Metals with a grant of $10,000, was announced about March 1, 1952. As of May 31, 1953, the second annual program—now a project of FSAF—has come to a close and plans have been made for conducting the third annual program during 1953-54. A publication of "Selected Science Teaching Ideas of 1952," based on teacher entries in the first awards program, has been produced under a special additional grant of $1000 from the American Society for Metals.

"Interim reports sent to the Board during the year have served to indicate the wide range of activities carried on through the headquarters office. It should be stressed, however, that responsibility for most of the major endeavors of NSTA is very much decentralized. Staff participation consists chiefly of carrying out de-

tails of policies and plans, collating and keeping records, handling the "business end" of the enterprise, and otherwise facilitating approved operations. I believe that all of us can take great pride in the extent to which members of NSTA share in carrying on the work of the Association. I firmly believe that NSTA must stand very nearly at the top among comparable groups in the degree of such participation. I know that the Board will want to vote "Thanks and deep appreciation" to the *several hundred* individuals who have rendered valuable service in such capacities as state and area directors, Packet Service evaluators, book reviewers for *TST*, authors and contributors to *TST* and *ESSB*, conference and convention participants, cooperators in conducting the projects of FSAF, and as members of our twenty or so committees.

"Now for a look at the membership situation. Enrollment figures for the year ending May 31, 1953 reveal four encouraging comparisons with totals of one year ago. (1) We have slightly more than held our own in individual memberships despite the increase in regular dues—4514 this year against 4494 last year. (2) There has been a decided decrease in the number of drop-outs—935 this year against more than 1500 a year ago. (3) The number of library subscribers continues to show a gain—716 this year against 637 last year. (4) Some 600 elementary schools enrolled in our school subscription plan during the first year of its operation. This category of subscribers may be expected to continue to grow—perhaps to the point of justifying the addition of an elementary science specialist to our staff! (Since this was written, about 300 additional elementary schools have joined the plan.)

"Membership promotion and retention are and will continue to be just about our biggest problems. The organization of state and area directors has been much improved during the year under the guidance of Martin Thames and his membership committee and their efforts should continue to bear fruit during the years ahead. Close to two hundred new members were enrolled at our regional conferences in Ann Arbor, Atlanta, and St. Louis and our national convention in Pittsburgh. Membership service materials have been sent to three hundred instructors of science education courses and workshops in summer schools. Twice during the year materials were mailed to our supplemental list of 13,000 science teachers who are *not* members of NSTA. Plans are already made for reaching this group at least three times during the year ahead. Because of the superior results from the individual, personal appeal, I am hopeful that our state and area directors, our Board of Directors, and our members, too, will exploit every opportunity to "tell the NSTA story" to groups of science teachers at various meetings throughout the year. Special efforts should be made to expand our elementary school enrollment.

"Next, a few reflections on financial operations during 1952-53. As the Treasurer's report will indicate, general operations this year involved income of better than $70,000 and expenditures of about $65,000. Adding in dedicated funds in other accounts, such as the Advisory Council, the Business-Industry Section, the awards program, and the Future Scientists of America Foundation, it is amazing to note that the NSTA enterprise in 1952-53 was practically a $100,000 program. (This is five times what the budget was in 1948-49, the first year of operating a headquarters office with NEA.) A few observations seem worthy of special mention:

1. Income from memberships and subscriptions amounted to a little less than $25,000—about 25 per cent of total.
2. Other major sources of income were: sale of publications, $9000; advertising, $10,000; Packet Service, $13,000; conferences and national convention (exhibits and registrations), $5000.
3. The Association journal, purchased three years ago through a non-interest loan by NEA, has now been paid for and is slightly more than paying its own way through the allocation of $1.50 per member or subscriber and supplementary advertising income.
4. The largest "operating margins" on general activities this year resulted from the sale of publications and the Packet Service.
5. On the expense side, salaries of staff employees (five full time and two part time) accounted for about $20,000—about 20 per cent of total.

"You may be interested to know that the office staff handles close to 100 outgoing pieces of correspondence daily; wraps and ships 12 to 15 packages of publications and other materials; last year handled over 2000 orders or subscriptions which had to be billed, many of them requiring a notary's signature and up to six copies of the invoice. Beyond these heavy duties, all printing of membership forms and the like are handled in the office. We produced 30,000 copies of the Packets last year. The Executive Secretary spends at least 25 per cent of his time "in the field" and in working with committees; edits THE SCIENCE TEACHER; handles the printing and distribution of the *Elementary School Science Bulltain.* Looking ahead to the fall months, our office staff will be comprised of the following: Robert H. Carleton, *Executive Secretary;* John H. Woodburn, *Assistant Executive Secretary;* Mary E. Batiste, *Administrative Assistant;* Claire V. Wadden, *Secretary* to Mr. Carleton; Paula F. Robertson, *Secretary* to Dr. Woodburn; Frances A. Keefauver, *Membership Secretary;* Thelma R. Denny, *Financial Secretary.*

"Finally, I wish to express my personal appreciation to President Harold E. Wise, to other members of our Executive Committee and the Board of Directors, to other members of our headquarters staff, and to all other persons with whom I have worked this year for their understanding and cooperation in advancing the objectives and activities of NSTA. It has been another year of privilege and pleasure to discharge the duties of the Executive Secretary's office."

(*Signed*) ROBERT H. CARLETON

Directors for Year 1953–54

Results of the mail ballot for officers and directors in the NSTA election held last May were announced by committee chairman Louise E. Lyons and confirmed by the Board of Directors at the Miami Beach meeting. Consequently, the NSTA Board of Directors for 1953-54 is as follows:

Dr. Grant

Executive Committee

Charlotte L. Grant (1954), *President*, Oak Park and River Forest High School, Oak Park, Illinois.

Harold E. Wise, (1954), *Retiring President*, University of Nebraska, Lincoln, Nebraska.

Walter S. Lapp (1954), *President-Elect*, Overbrook High School, Philadelphia, Pennsylvania.

Zachariah Subarsky (1954), *Secretary*, Bronx High School of Science, New York City.

John S. Richardson (1954), *Treasurer*, Ohio State University, Columbus, Ohio.

Robert H. Carleton, *Executive Secretary*, 1201 Sixteenth Street, N. W., Washington, D. C.

Regional Vice-presidents

Elra M. Palmer (1955), *Eastern*, Board of Education, Baltimore, Maryland.

Dean Stroud (1954), *North Central*, Amos Hiatt Junior High School, Des Moines, Iowa

Greta Oppe (1954), *Southern*, Ball High School, Galveston, Texas.

Stanley E. Williamson (1955), *Western*, Oregon State College, Corvallis, Oregon.

Regional Directors

Helen E. Hale (1955), *Eastern*, Baltimore County Schools, Towson, Maryland.

John G. Read (1955), *Eastern*, Boston University, Boston, Massachusetts.

John E. Habat, Jr. (1954), *North Central*, Shore Junior High School, Euclid, Ohio.

Mrs. M. Gordon Brown (1954), *Southern*, Board of Education, Atlanta, Georgia.

H. M. Louderback (1955), *Western*, Lewis and Clark High School, Spokane, Washington.

Robert Stollberg (1955), *Western*, San Francisco State College, San Francisco, California.

Directors at Large

Blanche Bobbitt (1955), Board of Education, Los Angeles, California.

Glenn O. Blough (1956), U. S. Office of Education, Washington, D. C.

Hubert M. Evans (1954), Teachers College, Columbia University, New York City

William F. Goins, Jr. (1955), Tennessee A. and I. University, Nashville, Tennessee.

Wayne Taylor (1956), Denton High School and Texas State College for Women, Denton, Texas.

Dorothy Tryon (1954), Redford High School, Detroit, Michigan.

Actions Taken

By the NSTA Board of Directors

The 1953 annual meeting of the NSTA Board of Directors was held June 26-27 at the Delano Hotel in Miami Beach, Florida. Committee reports, the reports of the treasurer and the budget committee, the executive secretary's report, and a review of the year's activities by outgoing president, Harold E. Wise, and a preview of plans for the year ahead by incoming president, Charlotte L. Grant, were highlights of the discussions. Important actions taken by the Board may be summarized briefly as follows.

1. Approved transferring the bookkeeping function from the treasurer to the headquarters office.

2. Approved revision of NSTA constitution as proposed in the March issue of *TST*, pages 89-91.

3. Approved employment of John H. Woodburn as Assistant Executive Secretary of NSTA. (Dr. Woodburn has taken a one-year leave of absence from his teaching position at Illinois State Normal University.)

4. Approved requests for NSTA affiliation by the Connecticut Science Teachers Association, the Chicago Teachers Science Association, and Science Teachers of New England.

5. Praised present membership promotion organization and approved continuation of these efforts.

6. Expressed pleasure that during the past year, NSTA's indebtedness to NEA has been reduced $5000.

7. Approved publication of six issues of the *Elementary School Science Bulletin* during the coming year.

8. Praised American Society for Metals for continuing its support of the Science Achievement Awards for Students and Recognition Awards for Science Teachers; likewise, praised the 28 business organizations who have contributed nearly $15,000 thus far for the general support of the NSTA Future Scientists of America Foundation.

9. Approved resolutions in behalf of or committee actions leading to: appointment of a qualified successor to Dr. Philip G. Johnson as specialist for science (secondary) in the U. S. Office of Education (Dr. Johnson has resigned to accept appointment as Professor of Science Education and Head of the Department at Cornell University); a call to superintendents and Boards of Education to encourage science teachers to attend professional meetings by liberalizing administrative and financial conditions for such attendance; supporting the stand taken by President Eisenhower with regard to "book burning" and the abridgement of freedom of thought and freedom of expression as stated in his letter to the American Library Association and reported in the *New York Times* of Saturday, June 27, 1953; expressing the Board's confidence in the National Bureau of Standards and its director, Dr. Allen V. Astin, and in the superior value of scientific tests, as

opposed to lay testimonials, in resolving conflicts as illustrated in the "battery additive case" involving the Bureau.

10. Directed that the 1953 annual report of the Executive Secretary be published in *TST* in order to give members and other readers a summarized picture of the variety and scope of NSTA activities.

By vote of the Board, next year's Nominating Committee will be instructed to offer at least two names for each position to be filled.

December Conference Promises Unusual Program

"Scientific Resources for Freedom—Men, Materials, Training, and Research" is the theme of the AAAS annual meeting set for December 26-30 in Boston. The AAAS science teaching societies, of which NSTA is one, have decided to emphasize "The Ocean" (Monday, December 28) and "The Land" (Tuesday, December 29). With the cooperation of industrial and research groups and personnel, the morning general sessions will be informative of current practices in the obtaining of products from these two sources.

Elementary school and secondary school science teachers will consider how to reach children and youth with these and other big ideas of science in parallel afternoon sessions. Attention will focus on how to reach those who will later need to become not only intelligent voters, but for some to become science-minded laymen or productive scientists and engineers.

An unusual technique has been developed for one of the parallel sessions which should not only let the facts be told, but should help science teachers country-wide to stand solidly on their accomplishments and act as a professional group, accepting valid criticism but educating the critics.

Sessions of the science teaching societies will convene in the Hotel Bradford. NSTA portions of the program will run from Sunday evening, December 27, through Wednesday noon, December 30. Dr. John G. Read of Boston University is NSTA's representative on the general planning committee of which Dr. Prevo Whitaker of Indiana University is coordinator. Read is also chairman for planning of the individual sessions of NSTA. Other committee heads are as follows:

Robert D. MacCurdy, NSTA Materials and liaison; Watertown, Massachusetts, Senior High School

Clifford R. Nelson, General Chairman Committee on Arrangements; President, Science Teachers of New England; Weeks Junior High School, Newton, Massachusetts

Arthur Burroughs, Publicity; Arlington, Massachusetts, Junior High School

Pearl Nelson, Hospitality; Williams School, Newton, Massachusetts

Lester C. Mills, School Exhibits; Beverly, Massachusetts, High School

Charles Howard, Weeks Junior High School, Newton, Massachusetts

William Winston, Audio-visual Aids; Newton, Massachusetts

The above committees are being assisted by the following science educators from the New England region:

Thomas Bagshaw, Junior High School, Watertown, Massachusetts

Wendell Bennet, Head of the Science Department, Natick, Massachusetts, High School

Albert Clish, Belmont, Massachusetts, High School (representing Eastern Association of Physics Teachers)

Sybil Daniels, Winchester, Massachusetts, High School

M. Ira Bubins, Framingham, Massachusetts, High School

J. Randolph Gibson, Farmington, Connecticut

Dorothy W. Gifford, Lincoln School, Providence, Rhode Island (representing New England Association of Chemistry Teachers)

Arthur Giovannangeli, State Teachers College, Keene, New Hampshire

Clark Hubler, Wheelock College, Boston, Massachusetts

Theresa Lammers, State Teachers College, Westfield, Massachusetts

Elsa Meder, Houghton-Mifflin Company, Boston, Massachusetts

Father Timothy O'Leary, Educational Headquarters, Archdiocese of Boston

Mary O'Rourke, Massachusetts State Department of Education, Boston

William F. Read, Arlington, Massachusetts, Junior High School

Ray Scott, Rindge Technical High School, Cambridge, Massachusetts

Sister Margaret, Emanuel College, Boston

Harold Sossen, Waltham, Massachusetts, High School

Paul Stockwell, Brattleboro, Vermont, High School

Harriet V. Zurlington, Rhode Island College of Education, Providence

Second National Convention to be in Chicago, April 1-3

Although one cannot discuss tradition in so young a venture as national conventions of NSTA, arrangements so far completed for the Second National Convention of the Association show promise of a meeting which will continue the high standards set at Pittsburgh. "Science Instruction, 1954" in elementary and secondary schools, in the colleges, and in national affairs will be the theme. All sessions of the convention will be held in the Morrison Hotel.

Dr. Harlan Hatcher, President of the University of Michigan, has accepted President Grant's invitation to deliver the keynote address Thursday afternoon, April 1. Those who heard Dr. Hatcher at the Ann Arbor meeting of NSTA will remember his deep interest in science education and his clear analysis of problems of science teaching.

Agnes Meyer, wife of the chairman of the Board of the *Washington Post*, Mr. Eugene Meyer, will address the Saturday morning general session of the convention. She can be counted on to recognize the implications of the current state of world affairs for science teaching.

The Chicago business-industry group, under the chairmanship of Miss Margaret Delaney of the American Institute for Baking, will sponsor a Thursday evening general session and social affair.

Twenty work-discussion groups will work on as many problems in science teaching, thus making it possible for every person attending to participate actively in the convention. Later everyone interested will be invited to choose the group he would like to join on the basis of the topic to be discussed.

Concurrent sessions and symposia will provide for the consideration of problems such as: Science in the Elementary School; Legal Obligations of the Science Teacher; Bridging the Gap Between High School and College; and the Four-Year Training Program for Science Teachers.

Clinical and "Here's How I Do It" sessions are also being planned for each teaching level.

Concurrent sessions and work-discussion groups will provide for at least six scheduled periods when attention will be focused on science instruction in the elementary school. Some of these periods will provide a choice of program for elementary teachers and supervisors.

Field trips on Thursday morning will include opportunities to many points of interest in the Chicago area, including the Museum of Science and Industry, a major research laboratory, a vocational high school, and an elementary school.

The Film Excerpt Committee of NSTA will hold previews of science teaching films which they have prepared. These will be scheduled during each day of the convention.

Commercial and educational exhibits of teaching aids and ideas for science will again be an outstanding feature of the convention.

And, the Second National Banquet of the Association, scheduled for Friday evening, will highlight the social and professional activity of the entire program.

Adding to the convenience of many convention attendants is the fact that the 1954 annual meeting of the National Association for Research in Science Teaching also will be held in Chicago the three days immediately preceding the NSTA convention. Thus it is possible to attend both meetings at no added cost for transportation.

The program for the NSTA convention is being arranged by a committee comprised of Ralph W. Lefler, *chairman,* Purdue University, Lafayette, Indiana; Robert Cooper, Ball State Teachers College, Muncie, Indiana; Allen F. Meyer, MacKenzie High School, Detroit, Michigan; John S. Richardson, Ohio State University, Columbus; Brother Fred T. Weisbruch, Don Bosco High School, Milwaukee, Wisconsin; and Charlotte L. Grant (President of NSTA), Oak Park and River Forest High School, Oak Park, Illinois and Robert H. Carleton (Executive Secretary of NSTA), Washington, D. C.

Antone Geisert, Assistant Audio Visual Director for the Chicago City Schools, is chairman of the local arrangements committee. He will announce the membership of his entire committee in an early issue of *TST*.

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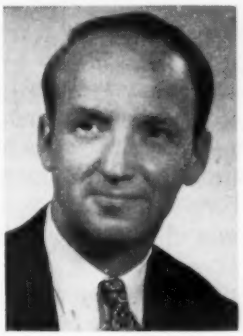
FSA Activities

John H. Woodburn Joins NSTA Staff



Dr. John H. Woodburn,

Dr. John H. Woodburn, Assistant Professor of Science at Illinois State Normal University, joined the NSTA staff August 17 to begin his duties as Assistant Executive Secretary. He will have chief responsibility for the Future Scientists of America Foundation activities and projects but will render service to the Association in other ways as well. He has also accepted a part-time appointment to the staff of McCoy College of the Johns Hopkins University in Baltimore.

Rapid expansion of the FSAF program necessitated this staff addition. Financial support of FSAF by business and educational groups has made it possible. First call upon Woodburn's time and talents will be the summarization and publication of findings from a research study concerned with programs of incentives, awards, career information, and specialized study opportunities for high school science students and teachers. The study involves two aspects of the problem: (1) the extent to which science teachers are alert to and make use of such services, materials, and programs; (2) the extent to which non-school groups provide such services and materials.

The information assembled from the inquiry will be published and widely distributed to science teachers and to interested and cooperating non-school groups. It is expected that this will be a real service in (a) the encouragement of more students to study science in grades 7-12; (b) the encouragement of more students to seek careers in fields of science, engineering, and science teaching; and (c) the provision of special study opportunities for science teachers and their outstanding students. Moreover, this study is regarded as an essential step in the further development of the FSAF program of helping to solve problems that are sure to get worse unless we can improve on a long-range basis our supply of engineering, technical, scientific, and science teaching personnel.

Woodburn is eminently qualified by interest, training, and experience to undertake his new duties. He has long been active in NSTA; is a member of the Advisory Council on Industry-Science Teaching Relations and has served as a Packet Service evaluator. Following several years' experience as a science and mathematics teacher in Ohio high schools, he completed his Master's degree at Ohio State University. His undergraduate degree was obtained at Marietta College.

Returning from Naval Service as a Lieutenant (jg), Woodburn joined the staff of Michigan State College. He taught in both the Department of Biological Science and the Department of Physical Science, and as a member of the Board of Examiners wrote comprehensive examinations in both fields. He has the Doctor's degree from Michigan State College and for the past four years has been on the staff of Illinois State Normal University. He has taken a leave of absence for the academic year 1953-54. John, his wife, Ruth, and their 7-year old daughter, Charleen, have established their new residence in Silver Spring, Maryland.

FSAF News Mailing List Now Being Compiled

The number of organizations interested in the objectives and work of FSAF is already quite large and is continuing to grow. In order to keep these organizations, as well as the FSAF Board of Consultants, appraised of the Foundation's progress, a suitable "newsletter" publication is to be established this fall. It is planned to develop a mailing list for its distribution that will include every group or organization desirous of cooperating at the high school level in the work of the Foundation or in cooperating or carrying on related activities pointed toward common objectives.

Science teachers can be of real help in developing this mailing list. Please send in the names of organizations in your locality or region that are engaged or interested in such activities. Business organizations, chapters of professional engineering or scientific societies, academies of science, and the like are suggested. Give the name of the individual to contact within each organization. It will help, too, if you will indicate briefly the kinds of efforts being put forth by the groups.

NSTA members will be kept informed about FSAF through *The Science Teacher*, the Packet Service, and occasional individual mailings.

The Foundation is especially interested in locally sponsored scholarships, contests, awards, and career counseling services that are directed toward junior and senior high school students. Descriptions of strictly local programs and services are desired so that potential sponsors in other communities can be given ideas of the kinds of incentive programs that may prove effective, appropriate, and desirable.

Announcing—

SCIENCE ACHIEVEMENT AWARDS FOR STUDENTS

The 1954 Program

FOR THE THIRD YEAR in a row, science students in grades 7 through 12 have the opportunity to win certificates and U. S. Bonds or cash awards and to bring national honor to themselves and their schools through high-quality activity work in science. Sponsored by the American Society for Metals and conducted as an activity of the Future Scientists of America Foundation of NSTA, the program offers 104 awards that total $5000. Since the program is designed to provide incentive and encouragement, especially in the earlier years of high school, the awards will be equally distributed throughout eight regions of the U. S.

Goals of the program will be served to no small degree by teachers calling this opportunity to the attention of their students and discussing with them the pressing needs of the nation for scientists, engineers, technicians, and science teachers. Enrollment figures indicate that "the big drop out" in science occurs at the end of grade 10. Hence general science and biology teachers have increased opportunity and responsibility to serve as counselors to the students in their classes and to encourage them to continue their studies in science and mathematics.

Lest there be some qualms on the part of some educators that this program indicates a lessening concern for "science in the general education of all the students," let it be said that such is definitely not the case. Through project and activity work in science, all the students can become more familiar with and develop a deeper understanding of the role of science in modern society, and its relation to our national economy, standards of living, and ability to defend ourselves as a nation.

The ASM-FSAF awards program is not a "talent search" type of program. However, it should help to make students aware of such opportunities early in their school careers and help get them started on the kinds of science work that may make them talent search winners later on. (Incidentally, seniors should be reminded that now is the time to prepare their entries for the 13th annual Science Talent Search for the Westinghouse Science Scholarships. Closing dates for project reports and tests is December 27. For more information on this program, write to Miss Margaret E. Patterson, Science Clubs of America, 1719 N St., N. W., Washington 6, D. C.)

The Science Achievement Awards program is easy to enter. It is not an essay contest although students are asked to prepare brief reports (about 300 words) on their work. There are no tests to be taken. Entries consist of the written report, photos or drawings as necessary to illustrate the work, and a filled-in student data form. Preliminary judging is done by regional committees and final judging by a national committee. All committees include science teachers from junior and senior high school levels, and professional scientists and engineers. Closing date for submitting entries is May 15, 1954.

The committee in charge of the 1954 program is as follows: Miss Helen E. Hale, *chairman*, Secondary School Supervisor, Baltimore County Public Schools, Towson, Maryland; Dr. R. Will Burnett, Professor of Education, University of Illinois, Urbana; Mr. John B. Chase Jr., Instructor, School of Education, University of Virginia, Charlottesville; Mr. Glenn W. Geil, Metallurgist, National Bureau of Standards, Washington, D. C.; and Mr. Harold Horn, Science Teacher, Montgomery Blair High School, Silver Spring, Maryland.

1953 Winners of

Science Achievement Awards for Students

By JOHN B. CHASE, JR., *Chairman*, Operating Committee
University of Virginia, Charlottesville

THE 1953 program of Science Achievement Awards for Students resulted in 83 winners of cash awards or U. S. Bonds and 130 winners of Honorable Mention certificates. The awards winners were distributed among 58 schools, while 56 additional schools shared in producing the Honorable Mention students.

Following the announcement of the program last fall, when more than 50,000 copies of the announcement poster were distributed, requests from teachers resulted in the distribution of 5000 copies of the Book of Rules and over 18,000 entry forms for students. Thus it is clear that the awards program has served to alert thousands of science students and teachers to the urgent need for science-trained people in our national life.

Student entries, identified only by code numbers, were sent to eight regional centers where preliminary judging was done. The judging committees then sent the students' entries, together with their recommendations, to the Washington office of NSTA where a national committee of judges completed the task of selecting the winners. It is interesting to note that almost without exception, the judgment of the national committee proved to be identical with that of the regional committees. Nearly six hundred entries passed through the judging procedures. It is of further interest to note that:

43 schools had more than one winner
9 schools had more than five winners
42 teacher sponsors had more than one winner
25 teacher sponsors had three or more winners
6 teacher sponsors had five or more winners

Howard B. Owens of Northwestern High School, Hyattsville, Maryland, led the list of teacher sponsors; he had seven students who won an award or honorable mention. Following closely were Paul Klinge of Thomas Carr Howe High School, Indianapolis, Indiana, and Herbert Reichard of Allentown, Pennsylvania, High School, each with six winners.

The complete roster of student winners of awards (nearly $5000 in value) and Honorable Mention follows, giving: the name of the student, the student's age and grade in school, the title of his project, his school and home town, and the name of his science teacher sponsor.

Region I

Grades 7-8

FIRST PLACE:

June Neumann (14 yrs. 8th) and Theodore Neumann (15 yrs. 8th): "Krilium-Soil Conditioner;" Noah Wallace Jr. H. S., Farmington, Conn.; J. Randolph Gibson.

Carol DiTrocchio (13 yrs. 8th) and Clione Anderson (13 yrs. 8th): "Regeneration of Planaria;" Noah Wallace Jr. H. S., Farmington, Conn.; J. Randolph Gibson.

SECOND PLACE:

Sandra Goodwin (13 yrs. 8th): "Penicillin—The Wonder Drug;" Noah Wallace Jr. H. S., Farmington, Conn.; J. Randolph Gibson.

Grades 9-10

FIRST PLACE:

Patricia Pascus (15 yrs. 9th): "A Study of the Blood;" Noah Wallace Jr. H. S., Farmington, Conn.; J. Randolph Gibson.

Janet Annaian (15 yrs. 10th): "Can Chromatic Effects Be Induced in the Floral Envelopes of the Narcissus?" Watertown Sr. H. S., Watertown, Mass.; Robert MacCurdy.

SECOND PLACE:

R. Bruce King (15 yrs. 10th): "Preparation of Transition Element Compounds;" Spaulding H. S., Rochester, N. H.; Paul Doe.

Stephen Buchanan (15 yrs. 10th): "Can Chicken Farming Be Controlled Electronically?" Watertown H. S., Watertown, Mass.; Robert MacCurdy.

Frederick Johnson (15 yrs. 9th): "Titanium;" Weston H. S., Weston, Mass.; Wallace Sawyer.

HONORABLE MENTION:

Donna Castner (16 yrs. 10th): "Hamster, Experimental Animal;" Keene H. S., Keene, N. H.; Helen Drugg.

David Donaldson (9th): "Tesla Coil;" Weston H. S., Weston, Mass.; Wallace Sawyer.

Louis Schell (14 yrs. 9th): "Penicillin;" John Wingate Weeks Jr. H. S., Newton Center, Mass.; Charles Howard.

Thomas Brewer (14 yrs. 9th): "What Different Types of Lenses Do to Light Rays;" John Wingate Weeks Junior H. S., Newton Center, Mass.; Charles Howard.

Alan Novins (15 yrs. 10th): "Relayless Electronic Calculator;" Spaulding H. S., Rochester, N. H.; Paul Doe.

Ethan Smith (14 yrs. 9th): "A Method of Locating Objects in Space;" Center Jr. H. S., Norwalk, Conn.; Mr. Hurlin.

Grades 11-12

FIRST PLACE:

Albert Momenthy (17 yrs. 12th): "Boron—The Element of the Future;" Roslindale H. S., Roslindale, Mass.; Mary Neal.

SECOND PLACE:

David Berube (17 yrs. 11th): "Manufacture of Metal Powders by Electrolysis;" Nelson W. Aldrich H. S., Lakewood, R. I.; Joseph Rohloff.

THIRD PLACE:

Llewellyn Bigelow (16 yrs. 12th): "Non-Poisonous Gold Plating;" Weston H. S., Weston, Mass.; Wallace Sawyer.

HONORABLE MENTION:

Richard Cushmon (16 yrs. 10th): "How Does the Electronic Organ Work?" Watertown Sr. H. S., Watertown, Mass.; Robert MacCurdy.

Richard Morse (17 yrs. 12th): "Telescope—Observatory Project;" Phillips Academy, Andover, Mass.; Elbert Weaver.

Albert Petersen, Jr. (17 yrs. 12th): "Iron and Steel—Reduction and Refining;" Farmington H. S., Unionville, Conn.; John Prymak.

Smiley Chase (16 yrs. 11th): "Lighting the Way for Physics;" Keene H. S., Keene, N. H.; Arthur Houston.

Region II

Grades 7-8

FIRST PLACE:

Paul Brest (12 yrs. 7th): "Synthesis of Ammonia;" Riverdale Country School, Riverdale, N. Y.; Mr. Palrand.

SECOND PLACE:

Rolfe Ferrara (13 yrs. 8th): "Electric Eye;" Canastota Central School, Canastota, N. Y.; Genevieve Lamp.

Bette-Lee Jarvis (12 yrs. 8th): "Study of the Eye;" Bala Cynwyd Jr. H. S., Bala Cynwyd, Pa.; James Getty.

Muriel Guy (14 yrs. 8th): "Narcotics and Stimulants;" Canastota Central School, Canastota, N. Y.; Genevieve Lamp.

HONORABLE MENTION:

William Retz (12 yrs. 7th): "The Making of Rayon Fibers;" Tappan Grammar School, Tappan, N. Y.; Helen Gilbert.

Grades 9-10

FIRST PLACE:

Robert Bogdal (14 yrs. 9th): "Corrosion of Metals;" Grant Jr. H. S., Syracuse, N. Y.; Charles Gardner.

Hans Toffer (16 yrs. 10th): "Energy from the Tides;" Allentown H. S., Allentown, Pa.; Herbert Reichard.

SECOND PLACE:

John Buck (15 yrs. 10th): "The Spectrum and the Green Plant;" Kenmore Sr. H. S., Kenmore, N. Y.; Louise A. Schwabe.

Frederick Greenleaf, Jr. (15 yrs. 10th): "Silicon Organics;" Allentown H. S., Allentown, Pa.; Herbert Reichard.

Richard Epand (15 yrs. 10th): "The Effects of Water Soluble Chlorophyll on White Rats;" Bronx High School of Science, Bronx, N. Y.; Herman Friedman.

HONORABLE MENTION:

Richard Chappell (14 yrs. 9th): "The Use of Homemade Weather Instruments;" Amherst Central H. S., Snyder, N. Y.; Herman Bowman.

Harry Rudloe (15 yrs. 10th): "A Multi-Purpose Phototube Relay;" Erasmus Hall H. S., Brooklyn, N. Y.; Mr. Murray.

Frank Witebsky (14 yrs. 9th): "The Area Occupied by a Molecule;" Nichols School, Buffalo, N. Y.; Paul Seamans.

Robert Moss (15 yrs. 10th): "Overcrowding Fish;" Abraham Lincoln H. S., Brooklyn, N. Y.; P. Goldstein.

Robert McIntosh, (14 yrs. 9th): "Nuclear Radiations;" Post Road Jr. H. S., White Plains, N. Y.; Dozier Drinkard.

Edward Houghton (14 yrs. 9th): "Life Cycle of Honey Bee Embedded in Plastic;" St. John's Atonement Seminary, Montour Falls, N. Y.; Rev. Urban Gillis, S. A.

Michael Fried (14 yrs. 10th): "The Effects of Ordinary and Ultraviolet Light on Buckwheat Fed Tribolium Confusum;" Forest Hills H. S., Forest Hills, N. Y.; Paul Brandwein.

Martin Glass (15 yrs. 10th): "Ability of Micro-Nutrients in Producing the Cyclopean Effect in Gastropods;" Forest Hills H. S., Forest Hills, N. Y.; Paul Brandwein.

Fred Roffe (14 yrs. 9th): "Combination Intercom and Transceiver;" Wilson Jr. H. S., Mount Vernon, N. Y.; Theresa Murphy.

Mark Levine (16 yrs. 10th): "Do Amino Acids and Sucrose Sprays Affect Dwarf Marigolds?" Abraham Lincoln H. S., Brooklyn, N. Y.; P. Goldstein.

Bruce Block (15 yrs. 10th) and James Howard (15 yrs. 10th): "Preparation of Skeleton of Canis Familiaris;" Nichols School, Buffalo, N. Y.; Paul Seamans.

Melvin Kalish (15 yrs. 10th): "Advantages of Hydroponics;" Port Richmond H. S., Staten Island, N. Y.; Sydney Rock.

Darvin DeMarchi (14 yrs. 10th): "The Dissectable Model of the Human Eyeball;" Nichols School, Buffalo, N. Y.; Paul Seamans.

Stuart Young (15 yrs. 10th): "Effects of Antiseptics and Disinfectants on Mold;" Forest Hills H. S., Forest Hills, N. Y.; Mr. Gillary.

Edward Hochstein (15 yrs. 10th): "My Useful Incubator;" Bronx High School of Science, Bronx, N. Y.; Mr. Skutulsky.

Lawrence Harris (15 yrs. 9th): "Cigar-Box Tesla Coil;" Town of Webb Schools, Old Forge, N. Y.; Mrs. Louise Watson.

Gerald Horn (15 yrs. 10th): "Men and Molds;" Kenmore Sr. H. S., Kenmore, N. Y.; Louise Schwabe.

James E. Walker (15 yrs. 10th): "Effects of Vitamins G (B_2) and D Deficiencies in Albino Rats;" St. John's Atonement Seminary, Montour Falls, N. Y.; Rev. Urban Gillis, S. A.

Gary Luhman (14 yrs. 9th): "Photoperiodism;" Kenmore Jr. H. S., Kenmore, N. Y.; G. Wessell.

John Filipsack, Jr. (14 yrs. 9th): "Snails and Snail Eggs;" St. Patrick's H. S., Syracuse, N. Y.; Sister Frances Marie.

John Miller (14 yrs. 9th): "Checking Variations in Commercial Power Frequencies;" Emmet Belknap Jr. H. S., Lockport, N. Y.; Gaylord Scheibner.

Paul Newcomb (14 yrs. 9th): "Construction of a Model Wind Tunnel;" Amherst Central H. S., Snyder, N. Y.; Richard Lape.

Ted Baffa (14 yrs. 9th): "Hydroponics;" Bala Cynwyd Jr. H. S., Bala Cynwyd, Pa.

Mary Lou Seitz (15 yrs. 10th): "Bacteria on Hands;" Our Lady of Mercy H. S., Rochester, N. Y.; Sister M. Stanislaus.

Bernice Ide (15 yrs. 10th): "Determining Isotonic Concentration of Cells;" Newtown H. S., Elmhurst, N. Y.; Maurice Bleifeld.

Deborah Weissman (14 yrs. 10th): "Resistance to Unfavorable Environmental Conditions in the Radish Seed;" Forest Hills H. S., Forest Hills, N. Y.; Paul Brandwein.

William Powell (15 yrs. 10th): "The Reflex Arc;" Amherst Central H. S., Snyder, N. Y.; Richard Lape.

Mary E. Schepp (15 yrs. 10th): "Heredity in Bacteria;" Canastota Central School, Canastota, N. Y.; Mrs. Madeline Mahoney.

John C. Broderson (14 yrs. 9th): "Electromagnets;" Grant Jr. H. S., Syracuse, N. Y.; Charles G. Gardner.

Robert Tucker (15 yrs. 10th): "Variations in Family Traits Through Heredity;" Newtown H. S., Elmhurst, N. Y.; Maurice Bleifeld.

Margot Dessauer (14 yrs. 9th): "The Action of Soap, Detergents and Softeners in Water;" Our Lady of Mercy H. S., Rochester, N. Y.; Sister Mary Edward.

Carl Johnson (15 yrs. 10th): "Chromatography;" Allentown H. S., Allentown, Pa.; Herbert Reichard.

Peter Pastreich (14 yrs. 10th): "The Effects of 4-Amino-Pteroylglutamic Acid on Rats;" Abraham Lincoln H. S., Brooklyn, N. Y.; Philip Goldstein.

John Bartholomew (14 yrs. 9th): "Plant Hormones;" Canastota Central Schools, Canastota, N. Y.; Mrs. Mahoney.

Grades 11-12

FIRST PLACE:

Robert Rubinstein (15 yrs. 12th): "Organometallosilanes and Organopolysilanes;" Lafayette H. S., Brooklyn, N. Y.; Joseph Castka.

SECOND PLACE:

Susanne Mehaffie (16 yrs. 11th): "Corrosive Properties of Altoona City Water;" Altoona Sr. H. S., Altoona, Pa.; John Yon.

THIRD PLACE:

Theodore Litzenberger (17 yrs. 12th): "Pulse Jet Engine;" Allentown H. S., Allentown, Pa.; Herbert Reichard.

HONORABLE MENTION:

Richard Stillman (15 yrs. 11th): "Application of the Methods of Solid Analytic Geometry to Chrystallographic Measurement;" Forest Hills H. S., Forest Hills, N. Y.; Paul Brandwein.

Albert Nagler (18 yrs. 12th): "Design and Construction of an Eight-Inch Telescope;" Bronx H. S. of Science, Bronx, N. Y.; C. Cafarella.

James Vaughan (18 yrs. 12th): "The Preparation and Use of Xerographic Plates;" Kenmore Sr. H. S., Kenmore, N. Y.; Rolland Gladieux.

Rimantas Glemza (16 yrs. 12th): "Effects of Tannic Acid on Iron;" St. John's Cathedral H. S., Paterson, N. J.; Sister Mary Virginia.

John Carmichael (18 yrs. 12th): "A Study of Autoradiography;" Kenmore Sr. H. S., Kenmore, N. Y.; Rolland Gladieux.

Mathias Coburn (16 yrs. 12th): "Comparing Wear Resistance of Metals by Electricity;" Brooklyn Technical H. S., Brooklyn, N. Y.; Robert Barrett.

Louis Gorman (17 yrs.): "The Cyclotron;" Theodore Roosevelt H. S., Fordham, N. Y.; Miss Nelson.

Stephen Hirsch (16 yrs. 11th): "Corrosive Effects of Gases on Nickel;" Bronx H. S. of Science, Bronx, N. Y.; Mr. Gewirtz and Dr. Harwell.

Edgar Storms (17 yrs. 12th): "The Relationships Between the Binding Forces of Molecules of Elements and Their Electronic Structures;" James Monroe H. S., Bronx, N. Y.; Alexander Taffel.

William Palmer (16 yrs. 11th): "The Construction of a Reflecting Telescope;" Forest Hills H. S., Forest Hills, N. Y.; Arthur Lazarus.

James Smeal (16 yrs. 11th): "Modern Electroplating;" Altoona H. S., Altoona, Pa.; John Yon.

Kenneth Wasserman (16 yrs. 11th): "Construction of Electronic 'Strobe' Light;" Forest Hills H. S., Forest Hills, N. Y.; Arthur Lazarus.

Stephen Bird (18 yrs. 12th): "Space Heating by Solar Radiation;" Allentown H. S., Allentown, Pa.; Herbert Reichard.

Robert Kandel (15 yrs. 11th): "Design of a Space Station;" Bronx H. S. of Science, Bronx, N. Y.; H. Gewirtz.

Elizabeth Brown (17 yrs. 11th): "Aluminum—Its Isolation and Its Compounds;" Altoona Sr. H. S., Altoona, Pa.; Mr. Hoffman.

William Smith (16 yrs. 12th): "Fluorochemical Experimentation;" Catholic Central H. S., Troy, N. Y.; Sister Frances Edward.

Arthur Pearlmutter (16 yrs. 12th): "Meteorics: A Revised Statistical Analysis;" Forest Hills H. S., Forest Hills, N. Y.; Paul Brandwein.

Carl Margolis (16 yrs. 11th): "Purifying Metals by Decomposing Their Iodides;" Erasmus Hall H. S., Brooklyn, N. Y.; James Murray.

Edward Gray (15 yrs. 11th): "Experiments with Crystals Including a Conductivity Experiment with Gypsum;" Forest Hills H. S., Forest Hills, N. Y.; Arthur Lazarus.

Joseph Marcus (17 yrs. 12th): "Photoelasticity and the Engineer;" Kenmore Sr. H. S., Kenmore, N. Y.; R. J. Gladieux.

Nancy Rochkind (16 yrs. 12th): "Uses of Paper Chromatography and Its Relationship to the Qualitative Analysis of Metallic Ions;" James Monroe H. S., Bronx, N. Y.; Alexander Taffel.

Richard Steyert (16 yrs. 11th): "Collection of the Elements;" Allentown H. S., Allentown, Pa.; Herbert Reichard.

Norman Schaaf (17 yrs. 11th): "The Theory and Application of Ion Exchange;" Cleveland Hill H. S., Cheektowaga, N. Y.; Grace Heacock.

John Gillespie (16 yrs. 11th): "De-Mineralizing Water by Ion Exchange;" Kenmore Sr. H. S., Kenmore, N. Y.; R. J. Gladieux.

Donald McNaboe (16 yrs. 11th): "Proper Methods of Riveting Aluminum to Prevent Electrolytic Corrosion;" St. John's Cathedral H. S., Paterson, N. J.; Sister Mary Virginia.

Region III

Grades 7-8

FIRST PLACE:

Peter Radding (13 yrs. 8th): "Engineering—Communications;" Seaford Special School, Seaford, Del.; Miss F. Murtice Holt.

Don Scott Lang (12 yrs. 7th): "Producing Cold from Heat;" Langley Jr. H. S., Washington, D. C.

SECOND PLACE:

Martha Blake (13 yrs. 8th): "Prehistoric Horses and Those of Today;" MacFarland Jr. H. S., Washington, D. C.; Harriet Bundick.

J. Paul Reason (12 yrs. 7th): "Photoelectric Cell for Wire-Photo;" Banneker Jr. H. S., Washington, D. C.; Mr. Millard.

James Matousek (13 yrs. 8th): "Steam Engines;" Benjamin Franklin Jr. H. S., Baltimore, Md.; Esther Rivkin.

HONORABLE MENTION:

Verdie Rogers (14 yrs. 8th) and Dorothy Tilton (14 yrs. 8th): "Rocks of the United States;" Lexington Jr. H. S., Lexington, Ky.; Leeomo Mason.

Leslie Paff (13 yrs. 8th): "Model Rocket;" Benjamin Franklin Jr. H. S., Baltimore, Md.; Esther Rivkin.

Morgan Hall (14 yrs. 8th): "Space Flight;" Benjamin Franklin Jr. H. S., Baltimore, Md.; Esther Rivkin.

Philip Specht (14 yrs. 8th): "Model Seismograph;" Kensington Jr. H. S., Kensington, Md.; Mrs. Curl.

Phyllis Franz (13 yrs. 8th) and Carol Webb (14 yrs. 8th): "Rocks of the Blue Grass Region;" Lexington Jr. H. S., Lexington, Ky.; Leeomo Mason.

Nan Harb (13 yrs. 8th) and Frances Stewart (13 yrs. 8th): "Shells;" Lexington Jr. H. S., Lexington, Ky.; Leeomo Mason.

Grades 9-10

FIRST PLACE:

Philip Lichtman (16 yrs. 10th): "Astronomical Photography with Homemade Telescopes and Cameras, and a Study of Lunar Motions;" Woodrow Wilson H. S., Washington, D. C.; Mrs. Louise Stull.

Robert Ambrose (15 yrs. 10th): "Effects of Krilium on the Nitrogen Content of Legume Nodules;" Northwestern H. S., Hyattsville, Md.; Howard Owens.

SECOND PLACE:

Mary Feeney (14 yrs. grade 9): "The Effect of Aureomycin on Healthy Chickens;" Holy Rosary Academy, Louisville, Ky.; Sister Felix, O. P.

Amy Evelyn Harvey (16 yrs. 10th): "Diatoms;" Northwestern H. S., Hyattsville, Md.; Howard Owens.

Mildred Elder (15 yrs. 10th): "Color Preference in Bird Feeding;" Northwestern H. S., Hyattsville, Md.; Howard Owens.

HONORABLE MENTION:

Bette Coder (15 yrs. 10th): "A Study of Chick Embryos;" Northwestern H. S., Hyattsville, Md.; Howard Owens.

Sally Groome (16 yrs. 10th): "New Lily Bulbs from Old Stems;" Northwestern H. S., Hyattsville, Md.; Howard Owens.

Jane Gager (15 yrs. 10th): "Artificial Lightning's Electrical Effect Upon the Growth of Plants;" Northwestern H. S., Hyattsville, Md.; Howard Owens.

Eugene Herman (16 yrs. 10th): "Grow Your Own Herbs in a Windowbox;" Calvin Coolidge H. S., Washington, D. C.; Mrs. Anna Barrett.

Marguerite Shepard (15 yrs. 10th): "Blood Types of Tenth Grade Girls at Eastern H. S. in Comparison with the U. S. Average;" Eastern H. S., Baltimore, Md.; Ruth Lenderking.

Emery White (15 yrs. 10th): "Construction of a Final Amplifier Stage Free from Unwanted Harmonics;" Glasgow H. S., Glasgow, Ky.; Miss Lee Smith.

Grades 11-12

FIRST PLACE:

James Hayes (16 yrs. 12th): "Use of Calculus in Solving a Civic Problem;" Booker T. Washington H. S., Norfolk, Va.; J. H. Johnson.

SECOND PLACE:

Jane Black (16 yrs. 11th): "Four Inert Minerals from the Potomac Sediments;" James Monroe H. S., Fredericksburg, Va.; Mildred Lapsley.

THIRD PLACE:

Ann Van de Putte (16 yrs. 11th): "Iron Bacteria;" Northwestern H. S., Hyattsville, Md.; Howard Owens.

HONORABLE MENTION:

Robert Bluehdorn (18 yrs. 12th): "Tape Recording;" Woodrow Wilson H. S., Washington, D. C.; Mrs. Louise Stull.

Jennifer Tipton (15 yrs. 11th): "Tracking Down Alpha Particles;" Central H. S., Fountain City, Tenn.; Lula Shipe.

Mary Shafer (18 yrs. 12th): "Agents of Corrosion;" Holy Rosary Academy, Louisville, Ky.; Sister Felix, O. P.

Clara Riedley (17 yrs. 11th): "Metals in Home Kitchen Chemistry;" Holy Rosary Academy, Louisville, Ky.; Sister Felix, O. P.

Region IV

Grades 7-8

FIRST PLACE:

Nancy Wilson (13 yrs. 8th): "My Studies of Bacteria;" Laboratory H. S., Collegeboro, Ga.; Dorothy Dohoney.

SECOND PLACE:

Horace Hillsman (13 yrs. 8th): "A House Wiring System;" Howard H. S., Atlanta, Ga.; C. M. Gibson.

HONORABLE MENTION:

Alvin Robins (12 yrs. 7th): "Water in the Service of Mankind;" Ida M. Fisher Jr. H. S., Miami Beach, Fla.; Elsie Thabit.

Grades 9-10

FIRST PLACE:

Charlie Payne (15 yrs. 9th): "Extraction of Oils;" Union Central H. S., Columbia, La.; E. S. Jenkins.

Jack Venable (14 yrs. 9th): "Six-Inch Newtonian Telescope;" Northside H. S., Atlanta, Ga.; Julia Newton.

SECOND PLACE:

Angelina Cordova (15 yrs. 10th): "In a Land of Hillside Farming;" Colegio Espirito Santo, Hato Rey, P. R.; Mother Mary Maristella.

Jerry Ayers (14 yrs. 9th): "A Home-Made Planetarium;" Brown Community H. S., Atlanta, Ga.; J. Edgar Morris.

Donald Hartwig (14 yrs. 9th) and Jon Traer (14 yrs. 9th): "Principle of the Jet Engine;" North Fulton H. S., Atlanta, Ga.; Belle Cooper.

HONORABLE MENTION:

Fred Wallwork (16 yrs. 10th) and Earl Ray (16 yrs. 10th): "Telescope Fun;" West End H. S., Birmingham, Ala.; Mary Hafling.

Robert Brinson (17 yrs. 10th): "Electrostatics;" Lanier H. S., Montgomery, Ala.; P. P. B. Brooks.

Jack Austin (14 yrs. 9th): "Motor" and "Magnetic Diver;" Fort Smith Jr. H. S., Fort Smith, Ark.; Ruth Armstrong.

Robby McGrew (14 yrs. 9th): "Self-Starting Electric Motor" and "Pocket-Size Crystal Receiver;" Fort Smith Jr. H. S., Fort Smith, Ark.; Ruth Armstrong.

Grades 11-12

FIRST PLACE:

Charles Yulish (16 yrs. 11th): "Atomic Energy, Blessing or Curse?" Miami Beach Sr. H. S., Miami Beach, Fla.; Birdie McAllister.

SECOND PLACE:

William Wright III (18 yrs. 12th): "Brownian Movement;" North Fulton H. S., Atlanta, Ga.

THIRD PLACE:

Richard Dix (16 yrs. 11th): "A Study of Some Thermal Characteristics of Insulating Materials;" Brown Community H. S., Atlanta, Ga.; J. Edgar Morris.

HONORABLE MENTION:

Alice Faye Hassler (17 yrs. 12th): "Constructing a Geiger Counter;" Ensley H. S., Birmingham, Ala.; Mrs. Rebal Ponder.

Mary Clare Langan (17 yrs. 12th): "Weather Observations;" Clearwater H. S., Clearwater, Fla.; Sarah Kirkpatrick.

Region V

Grades 7-8

FIRST PLACE:

Sandra Mueller (13 yrs. 8th): "Dissecting Animals;" Haven Jr. H. S., Evanston, Ill.; Alfred Lazow.

Alden Campbell (14 yrs. 8th): "The Microscope —Its Parts and Use;" Haven Jr. H. S., Evanston, Ill.; Louise Hollweg.

SECOND PLACE:

Eugene Mohr (13 yrs. 8th): "Geiger Counter;" Haven Jr. H. S., Evanston, Ill.; Steve Hall.

Bruce Klepinger (13 yrs. 7th): "The Study of Rocks and Minerals;" St. James Lutheran School, La Fayette, Ind.; Herbert Schillinger.

Patricia Chapman (14 yrs. 8th) and Judith Haynes (13 yrs. 8th): "Hydroponics;" Roann H. S., Roann, Ind.; Keith Hunnings.

HONORABLE MENTION:

Harris Sullivan (13 yrs. 8th): "Steam Powered Direct Current Generator;" Haven Jr. H. S., Evanston, Ill.; Alfred Lazow.

Buckley Smith (13 yrs. 8th): "Electrically Driven Hand-Made Truck;" Haven Jr. H. S., Evanston, Ill.; Alfred Lazow.

Albert Huggard (13 yrs. 7th): "Exploring the Weather;" Nichols Intermediate School, Evanston, Ill.; Minniejane Drey.

Roger Stiller (13 yrs. 8th): "Reflective Contours;" Roxboro Jr. H. S., Cleveland Heights, Ohio; Bulah Barber.

Robert McLean (13 yrs. 7th): "Metallic Elements;" Haven Jr. H. S., Evanston, Ill.; Louise Hollweg.

Ronnie Larsen (13 yrs. 8th): "Photography;" Haven Jr. H. S., Evanston, Ill.; Louise Hollweg.

Karl Barthelmess (13 yrs. 8th): "Radio and the Effect of the Ionized Layer;" Haven Jr. H. S., Evanston, Ill.; Louise Hollweg.

Grades 9-10

FIRST PLACE:

Arthur Dunkle (14 yrs. 9th): "A Statistical Study of Manganese Analysis in B 1111 Steel;" Boardman H. S., Youngstown, Ohio; Edward Istnick.

James Barnes (16 yrs. 10th): "Tissue Culture of Chick Embryo;" Thomas Carr Howe H. S., Indianapolis, Ind.; Paul Klinge.

SECOND PLACE:

Richard Dunham (14 yrs. 9th): "Experiment in Composting;" York Community H. S., Elmhurst, Ill.; Alice E. Shanske.

Robert Little (16 yrs. 10th): "Medical Mycology;" Thomas Carr Howe H. S., Indianapolis, Ind.; Paul Klinge.

Joann Brown (16 yrs. 10th): "Micro-Dissection of Daphnia;" Thomas Carr Howe H. S., Indianapolis, Ind.; Paul Klinge.

HONORABLE MENTION:

Raymond Blake (15 yrs. 10th): "Tesla Transformer;" Highland Park H. S., Highland Park, Mich.; Harold Burch.

Edward Lollis (15 yrs. 10th): "Habits of Bluebirds as Observed in a Series of Bird-Houses;" Thomas Carr Howe H. S., Indianapolis, Ind.; Paul Klinge.

Ronald Tarris (15 yrs. 10th): "Reproduction;" York Centralized School, Clyde, Ohio; C. E. Slater.

Beatrice Crouse (15 yrs. 10th): "Artificial Parthenogenesis on Toad Eggs;" Thomas Carr Howe H. S., Indianapolis, Ind.; Paul Klinge.

Hoyt Miller (16 yrs. 10th): "Kodachromes of Pig Dissection;" Thomas Carr Howe H. S., Indianapolis, Ind.; Paul Klinge.

Grades 11-12

FIRST PLACE:

Edmund Richards (17 yrs. 12th): "An Original Approach to Radio-Carbon Dating;" Belleville Township H. S., Belleville, Ill.; M. Hillard.

SECOND PLACE:

William Gothard, Jr. (18 yrs. 12th): "Photography in the Science of Developing Steel;" Lyons Township H. S., La Grange, Ill.; O. Warning.

THIRD PLACE:

Daniel Shannon (17 yrs. 12th): "Resistivity of Gases at Low Temperatures;" St. Xavier H. S., Cincinnati, Ohio; T. W. Gedeon, S. J.

HONORABLE MENTION:

Barry Berman (17 yrs. 12th): "Interconversion of Energy;" Von Steuben H. S., Chicago, Ill.; H. Jackson.

David Stevenson (16 yrs. 11th): "Magnetic Tape Recording;" Elmhurst H. S. Fort Wayne, Ind.; Ruth Wimmer.

Patrick Ledden (16 yrs. 11th): "Alumina Chromatography;" Central Catholic H. S., Fort Wayne, Ind.; Sister Mary Agnita.

Roger Barry (17 yrs. 12th): "Mirror Research;" Withrow H. S., Cincinnati, Ohio; H. T. Caskey.

Mary Ellen Bendel (17 yrs. 11th): "Chlorophyll Extraction;" Central Catholic H. S., Fort Wayne, Ind.; Sister Mary Agnita.

Patricia Junk (16 yrs. 11th): "Carotenoids;" Central Catholic H. S., Fort Wayne, Ind.; Sister Mary Agnita.

Region VI

Grades 7-8

HONORABLE MENTION:

Richard Reznichek (13 yrs. 8th): "Seed Germination Box;" Wisconsin H. S., Madison, Wis.; Dean Wessels.

Grades 9-10

SECOND PLACE:

Gene Uehling (16 yrs. 10th): "Construction of My Television Set;" Aquinas H. S., La Crosse, Wis.; Sister M. Dolorosa.

Grades 11-12

FIRST PLACE:

Donald Dezek (17 yrs. 11th): "Electric Eye;" Mary D. Bradford H. S., Kenosha, Wis.; Philip A. Whitaker.

SECOND PLACE:

Leroy Krzycki (16 yrs. 11th): "The Design, Construction, and Operation of a Liquid Fuel Rocket Motor;" Columbus H. S., Columbus, Neb.; Gladys Colwell.

THIRD PLACE:

Arthur Cook (16 yrs. 11th): "Studies in Chromatography;" Aquinas H. S., La Crosse, Wis.; Sister M. Dolorosa.

Region VII

Grades 7-8

FIRST PLACE:

Arthur Chester (12 yrs. 8th): "Formulas and Tables for Regular Polygons;" Baker Jr. H. S., Austin, Tex.; Ray Pine.

SECOND PLACE:

Gary Losh (13 yrs. 8th): "Meteorology;" Roosevelt Jr. H. S., Coffeyville, Kan.; Miss Macoubrie.

Grades 9-10

FIRST PLACE:

Eleanor Millard (14 yrs. 10th): "The Effect of Water Soluble Chlorophyll on the Regeneration and Survival Rate of Planaria;" Stephen F. Austin H. S., Austin, Tex.; Mrs. Edna Boon.

Robert Ronzio (14 yrs. 9th): "Crystals and Their Uses;" Los Alamos H. S., Los Alamos, N. Mex.; J. Lyon.

SECOND PLACE:

Beverly Webb (14 yrs. 9th) and Myrna Kidd (15 yrs. 9th): "Lack of Vitamin C in Guinea Pigs;" Norman Jr. H. S., Norman, Okla.; Vivla Johnson.

Mike Bross (15 yrs. 9th) and Lynn Murrell (14 yrs. 9th): "Principles of Television;" Norman Jr. H. S., Norman, Okla.; Mrs. Vivla Johnson.

Anne Stovall (15 yrs. 9th): "Lapidary Project;" Norman Jr. H. S., Norman, Okla.; Mrs. Vivla Johnson.

HONORABLE MENTION:

Kay Lee (15 yrs. 10th): "A Study and Classification of the Plant and Animal Kingdom;" Norman Jr. H. S., Norman, Okla.; Mrs. Vivla Johnson.

Buster Wilburn (14 yrs. 9th): "Drilling with Diamond Bits and Core Barrels;" Norman Jr. H. S., Norman, Okla.; Mrs. Vivla Johnson.

Grades 11-12

FIRST PLACE:

Virgil Barnes (17 yrs. 12th): "An Investigation of Selected Radioactive Ores Using Thick-Emulsion Photography;" Austin H. S., Austin, Tex.; Mrs. Edna Boon.

SECOND PLACE:

Thomas Manuel (17 yrs. 12th): "The Separation of Group II Cations by Ion Exchange Resins;" Austin H. S., Austin, Tex.; Mrs. Clara Weisser.

Region VIII

Grades 7-8

FIRST PLACE:

Jeanne Ruenitz (12 yrs. 7th): "Wild Flowers of Southern California;" Lincoln Jr. H. S., Santa Monica, Calif.; Robert Lietch.

SECOND PLACE:

Marilyn Brooks (13 yrs. 8th): "The Web of Life: Distributions of Fauna and Flora of the Northern Hemisphere;" Lincoln Jr. H. S., Santa Monica, Calif.; Mr. Robert Lietch.

Carl Svoboda (13 yrs. 8th): "High Frequency Apparatus;" Woodrow Wilson Jr. H. S., Oakland, Calif.; M. Phelan.

HONORABLE MENTION:

Philip Webber (14 yrs. 8th): "Amateur Photography Unit;" Hamilton Jr. H. S., Seattle, Wash.; R. Gantert.

William Marshall (13 yrs. 8th): "Modernization of Diesel;" Hamilton Jr. H. S., Seattle, Wash.; R. L. Gantert.

Marvin Stanley (13 yrs. 8th): "Salamanders and Newts At Home;" McChesney Jr. H. S., Oakland, Calif.; Robert Ewing.

Gordon Steffen (13 yrs. 8th): "Crystal Radio;" Logan Jr. H. S., Logan, Utah; M. V. Coombs.

Grades 9-10

FIRST PLACE:

Stanley Lee (17 yrs. 10th): "Reproduction of Early Microscopes;" Salem Sr. H. S., Salem, Ore.; Miss Carmelita Barquist.

Sidney Handlin (14 yrs. 9th) and John Kulander (14 yrs. 9th): "The Effect that Penicillin Has on the Sprouting and Growing of Seeds;" Edmond S. Meany Jr. H. S., Seattle, Wash.; Miss V. F. Kent.

SECOND PLACE:

Harley Blankenship (15 yrs. 10th) and George Fischer (15 yrs. 10th): "Climatic Conditions of Lava Caves;" Tulelake H. S., Tulelake, Calif.; Beatrice Willard.

Robert Dycus (16 yrs. 10th): "The Ecliptic System of the Celestial Sphere;" Lewis and Clark H. S., Spokane, Wash.; H. M. Louderback.

Ann Lowery (15 yrs. 10th): "Enemies of Oregon Industries and Their Control;" Salem Sr. H. S., Salem, Ore.; Irene Hollenbeck.

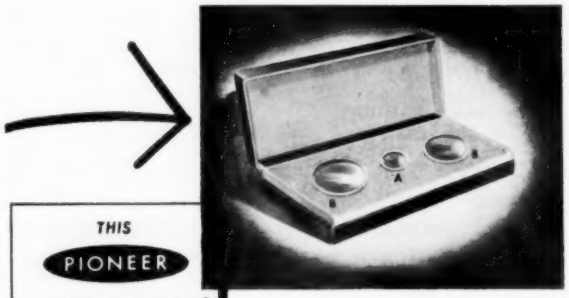
HONORABLE MENTION:

Kyrk Reid (14 yrs. 9th): "My Work with Hartmanella in the Kingdom of the Invisible;" Carmel H. S., Carmel, Calif.; Enid Larson.

William Schonbein (14 yrs. 9th): "High Vacuum Unit;" Hamilton Jr. H. S., Seattle, Wash.; Robert Gantert.

John Robson (16 yrs. 10th): "The Reaction of Plant Seedlings to Gravity;" North Phoenix H. S., Phoenix, Ariz.; Lorenzo Lisonbee.

Eldridge Moores (14 yrs. 10th): "Effect of Gravity on the Roots and Stems of the Corn Seed-



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ling;" North Phoenix H. S., Phoenix, Ariz.; Lorenzo Lisonbee.

Rosemary Gilbert (15 yrs. 10th): "How to Use a Key to Identify Winter Twiggs;" Salem Sr. H. S., Salem, Ore.; Irene Hollenbeck.

John Goodman (13 yrs. 9th): "Photo-Electric Cell;" Hamilton Jr. H. S., Seattle, Wash.; R. L. Gantert.

Carol Stoldt (15 yrs. 10th): "Fermentation Studies of Raw and Pasteurized Milk;" North Phoenix H. S., Phoenix, Ariz.; Lorenzo Lisonbee.

William Collier (15 yrs. 10th): "Finding the Genetic Make-Up of a Hooded Rat;" North Phoenix H. S., Phoenix, Ariz.; A. B. Clark.

Richard Erickson (15 yrs. 10th): "Photosynthesis;" Lincoln H. S., Seattle, Wash.; R. L. Gantert.

Grades 11-12

FIRST PLACE:

Wayne Yunker (17 yrs. 12th): "Anodizing Aluminum;" Corvallis H. S., Corvallis, Ore.; P. N. Spelbrink.

SECOND PLACE:

Roderic Thomas (17 yrs. 12th): "A Study in Luminescence;" El Cerrito H. S., El Cerrito, Calif.; Theodore Beck.

THIRD PLACE:

Rodney Whitefield (17 yrs. 12th): "The Reduction of Silicon by the Formation and Thermal Decomposition of Silicon Hydrides;" Lewis and Clark H. S., Spokane, Wash.; H. M. Louderback.

HONORABLE MENTION:

Richard Robertson (17 yrs. 12th): "A Study of Structures and Thermal Effects of Steel;" Berkeley H. S., Berkeley, Calif.; Robert Rice.

Gene Falck (16 yrs. 11th): "Impurities in Crystallization;" Phoenix Union H. S., Phoenix, Ariz.; James Wilson.

Certificates and awards from the Future Scientists of America Foundation have been prepared for all the above students and will be presented around the first of October. School assembly presentations will be made in most instances and representatives of NSTA and of the sponsor of the program, the American Society for Metals, will participate. Announcement of the 1954 program of Science Achievement Awards will be found on page 192 of this issue of *The Science Teacher*.

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Books Received

FROM LODESTONE TO GYRO-COMPASS. H. L. Hitchins and W. E. May. 219 pp. $4.75. Philosophical Library. New York City. 1953.

An introduction to all branches of the subject of compasses. Of interest to the person who has to use the instrument as well as the one who likes to read of scientific achievement and its history.

PLANTS OF ROCKY MOUNTAIN NATIONAL PARK. Ruth A. Nelson. 201 pp. $1.00 (paper). National Park Service. United States Department of the Interior.

A helpful reference for general use by persons who want to know about the flowers, trees, shrubs, and ferns of the Central Rocky Mountains. Includes a glossary and many excellent photographs and diagrams. For sale by the Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C.

FLYING SAUCERS. Donald H. Menzel. 319 pp. $4.75. Harvard University Press. Cambridge, Massachusetts, 1953.

With humor, imagination, and common sense, the author describes all types of apparitions from mirages and sundogs to Ezekiel's wheels. In answering the question "What Are The Flying Saucers?", Dr. Menzel points out that truth can be as strange as fiction.

Winners in 1953 Program of

RECOGNITION AWARDS FOR SCIENCE TEACHERS

By HELEN E. HALE, Chairman, Judging Committee

Baltimore County, Maryland, Public Schools

WHEN the American Society for Metals established the offering of Science Achievement Awards for Students, Dr. William H. Eisenman, Secretary of ASM, said, "Let's also do at least *something* to recognize the important work of the teacher in encouraging and guiding these young students." Accordingly, the committee in charge of the program set aside $1000 to be awarded to science teachers for essays or reports on their most effective ways of working with students, individually or in small groups, or in such other ways as they choose to discuss. The committee approved up to twenty $50 prizes to be awarded at the discretion of the judges. (The prizes for 1954 have been revised to provide awards of $400, $300, $200, and $100.)

The judging committee for the 1953 essays have selected eighteen essays to receive $50 awards and ten other entries for Honorable Mention. According to observations of the judges, there is good geographical distribution of these twenty-eight papers and also good distribution among men and women. There is wide variety among the subjects discussed and good representation as to type of school: elementary, junior high, senior high, and college; public and private; large and small schools. One goal of this awards program is to facilitate the exchange of good science teaching ideas. Hence it is anticipated that some of the papers, whether winners or not, will be published in THE SCIENCE TEACHER during the current school year.

The judges pointed out that there are four repeaters among this year's awards and honorable mention entries. Mrs. Ruth Essig and Mr. S. M. Pattee won awards in 1952 and again this year. Mr. Milton S. Lesser gained honorable mention last year; won an award this year. Mr. Robert MacCurdy who received honorable mention this year won an award in 1952.

Members of the 1953 judging committee were: Miss Helen E. Hale, *Chairman*, Secondary School Supervisor, Baltimore County, Maryland Public Schools; Mr. Louis Cox, Science Instructor, State Teachers College, Towson, Maryland; Mr. Coy Glass, representing American Society for Metals, Johns Hopkins University; Miss Madeleine Skirven, Biology Teacher, Eastern High School, Baltimore, Maryland; and Mr. William Howell Weed, Chief Process Engineer, Mutual Chemical Company of America.

The following listing gives the names of the teachers who were selected for awards (indicated by *A*) and Honorable Mention (indicated by *HM*), together with their schools and teaching positions, the title of each entry, and a brief statement describing the nature of the entry.

Bagshaw, Thomas L. (HM) General Science Teacher, East Junior High School, Watertown, Mass. "Results of a Study for the Reorganization of a General Science Course of Study." The author bases his proposed reorganization on a study of science interests and preferences of pupils in the junior high schools of Watertown. He proposes an extension of the present program of junior high school science to include work in the seventh grade, and has worked out units for all three junior-high school levels.

Bleifeld, Maurice (A) Biology Teacher, Newtown High School, Elmhurst, N. Y. "Planting an Interest in Science Among Honor Class Pupils." It is felt that bright students do not arrive in high school with any special interest in science. Having identified and regrouped these honor students, a program is initiated aimed at starting operations at the success level through group activity, leading through projects into individual work.

Busch, Mrs. Phyllis B. (A) Teacher of Biological Sciences, Abraham Lincoln High School, Brooklyn, N. Y. "A Guided Trip to the Hall of Conservation, American Museum of Natural History," A group report with Ira Shein and Sam Katz. As a device to aid in teaching conservation of natural resources a series of "trails" or guides to tours of exhibits in the Felix M. Warburg Memorial Hall on Conservation is presented as a planned program for three different teaching levels.

Caballero, Mrs. Miguel A. (A) Head of Science Department, Red Bank High School, Chattanooga, Tenn. "Utilizing Community Resources in Teach-

ing Science." As an integral part of a whole six-year science program, the most is made of affiliations with national groups and with local sources of backing and cooperation.

Creaser, Myrtle E. (HM) Teacher of Ninth-Grade Science, Washington Junior High School, Kenosha, Wis. "Health Teaching." Several practical suggestions are described and some visual aids are pictured to help the ninth-grade teacher with his work in health.

Dale, Mrs. Catherine W. (HM) General Science Teacher, Calumet Township High School, Gary, Ind. "The Encouragement of Science-Talented Young People." The writer "sold" science projects and a science fair to her pupils through an active science club which attracted more than one-third of the junior-high school enrollment. A number of students who had no educational intentions beyond high school were encouraged to prepare for college and to seek parental support for their new ambitions.

Drapkin, Herbert (A) Teacher of Biology and General Science, William Cullen Bryant High School, Long Island City, N. Y. "Enriching Science for Youngsters." The author describes an extra-curricular program affording an opportunity for individual science experimentation at the elementary-school level, as offered at the Queens Youth Center, Queens College, N. Y.

Essig, Mrs. Ruth (A) Instructor, University Extension, University of California, Los Angeles, Cal. "Coffee Can Kit." A series of experiments with magnets and batteries is outlined in a manual supplied with a simple kit, assembled by the author, that fits into a coffee can. Mrs. Essig hopes to commercialize the kit.

Goldstein, Philip. (A) Biology Teacher, Abraham Lincoln High School, Brooklyn, N. Y. "I'll Never Do It Again." The author feels that science talent grows out of science interest, development of which is synonymous with discovery of science talent. Working with an honors class, he demonstrated that science talent could be developed, but he appears to have found it an exhausting task.

Good, Wallace M. (A) Teacher of Science, Physical Geography, and Physiology, Wyandotte High School, Kansas City, Kan. "Report of the Wyandotte High School Science Field Club." A high school science field club is used as a teaching tool designed to provide essential experiences for boys contemplating entrance into professional fields of science. The club also aids in early identification of students with scientific interest and potential.

Gray, Elizabeth (A) Biology Teacher, Forest Hills High School, Forest Hills, N. Y. "A Bio-Arts Club." The making of biological models, using various techniques, not only stimulates interest in science through creative work but also furnishes the school with valuable models some of them unobtainable elsewhere.

Heinrich, Edwin P. (A) Teacher of Physics, Senior Mathematics, and Ninth-Grade Science, The Sidwell Friends School, Washington, D. C. "The Actinoscope, a Device to Demonstrate the Presence of Ionizing Radiation." The author has designed and constructed a simple and inexpensive instrument for use in secondary-school science classes for demonstrating the existence of invisible electromagnetic radiation.

Johnson, Dr. Vivla V. (HM) General Science Teacher, Norman Junior High School, Norman, Oklahoma. "How to Individualize Instruction in Large Classes." A number of procedures for individualizing instruction are described in some detail: use of workbooks, outside conferences, projects, student presentations, the science club, science fairs and "nights," and even examinations. Practical "How to Study" hints are included in the report.

Kahme, Flora (A) Teacher of Grades Seven and Eight, Port Jefferson Elementary School, Port Jefferson, Long Island, N. Y. "Port Jefferson Elementary Science Exhibit." The organization of a science fair at the elementary school level is described and its contributions to the school's program are evaluated by the teaching staff.

Larson, Enid A. (A) Teacher of General Science and Biology, Carmel High School, Carmel, Cal. "A Living Laboratory: Carmel High School's Natural Area." An unused plot of land was set aside for the exclusive use of the Biology Department in a study program with far-reaching effects involving many subjects and skills beyond the immediate field of biology.

Leitch, Robert B. (A) Science and Social Studies Teacher, Lincoln Junior High School, Santa Monica, Cal. "Integration and Visualization of Science and Geography." Faced with the necessity of shortening a seventh-grade course in science from a year to a semester to make room for a semester of geography of the eastern hemisphere, the author successfully combined the two subjects on the basis that every geographical concept has a scientific explanation

(Continued on next page)

and every scientific principle has a direct or indirect application to geography.

Lesser, Milton S. (A) Biology Teacher, Thomas Jefferson High School, Brooklyn, N. Y. "Providing for the Teaching of Some of the Elements of the Scientific Method." A classroom experiment on digestion of starch to sugar by saliva in the mouth is used to demonstrate the scientific method of problem solving. The author insists that his pupils consider numerous possibilities and exercise many cautions before drawing conclusions.

López, Mrs. Eloisa P. (HM) Teacher of the Fourth and Eighth Grades, Colegio del Espiritu Santo, Hato Rey, Puerto Rico. "Techniques for Bridging the Gap in Science Between the Elementary and Junior High School." A teacher with 43 years of experience gives suggestions for teaching elementary science through familiar experiences with due emphasis on the social and economic aspects of science. Habits, attitudes, and problem-solving skills are instilled early.

MacCurdy, Robert D. (HM) Biology Teacher, The Senior High School, Watertown, Mass. and teacher of an Outdoor Science Education Workshop at Boston University. "Some Practices and Ideas for Use in Science Education." A series of papers which have been published in various educational journals is compiled in the report. Titles include "Modern Marks with Meaning," "Going Fishing—for Scientists and Engineers," "Is Our Survival Potential Dependent on Improved Science Education?" and "The Science Fair is Easy if You Let the Students Do It!"

Mason, Mrs. Leeomo Galliher (A) Seventh-Grade Science, Mathematics, and Core teacher, Lexington Junior High School, Lexington, Ky. "Tree Study." A complete study unit for the eighth grade is presented, including an original and simple key for identifying trees by their leaves.

Merrill, Mrs. Helen L. (HM) Teacher of English, Trigonometry, and Physical Science, Duncan U. Fletcher High School, Jacksonville Beach, Fla. "An Elective Course in Physical Science: Man in a Challenging World." The author has worked out a nine-unit course predicated on twelve philosophical and educational concepts. Suggestions for classrooms procedures are included in the report.

Nelson, Clifford R. (HM) Teacher of Science Eight and Science Nine, Weeks Junior High School, Centre Newton, Mass. "About Me." The author gives his pupils a very personal approach to the study of heredity.

Parker, James Albert (A) Related Physics Teacher, Armstrong Technical High School, Washington, D. C. "A Partial Outline for a Course of Study in Related Physics." Operations of the machine shop are related to scientific principles of physics.

Pattee, Steven M. (A) Biology Teacher, Roosevelt High School, Cedar Rapids, Iowa. "Let's Learn About the Rodents of Eastern Iowa," A group entry, with the Misses Lorene Harrington and Betty Terril and Mr. Chester Mau. The Biology Club publishes a series of natural history booklets of which the entry is a sample. The work also involves the departments of art, English, and printing as well as many outside sources of assistance, and the booklets are in demand by teachers of other natural sciences.

Polzin, Weldon E. (HM) Teacher of Science Seven and Science Eight, San Marcos Junior High School, San Marcos, Texas. "Science and Student Interest." In addition to some basic assumptions about science teaching, the author presents specific teaching suggestions. The general objectives for the science program are listed. Student interest is demonstrated through a series of photographs showing student demonstrations, field trips, classroom activity, a science fair, and science assemblies.

Reichard, Herbert H. (A) Physics Teacher, Allentown High School, Allentown, Pa. "The Seventh Annual Lehigh Valley Science Fair." The entry is a most complete scrapbook, offering a warm and comprehensive picture of an activity covering an area of eight counties.

Taffel, Alexander (HM) Science Teacher, James Monroe High School, The Bronx, N. Y. "Experiences in Science for Homework." The author assigns first-hand experiences for homework. He has interested other teachers in this type of assignment, and at the time the report was written, direct-experience homework has been tried in the general science, biology, chemistry, and physics departments of the author's school.

Yoder, Harold D. (A) Biology Teacher, Altoona Senior High School, Altoona, Pa. "An Elementary Microbiology Course for Senior High School Students." A course in general bacteriology is outlined for the better general student and for pupils who plan to enter nursing, pharmacy, medicine, and other related professions.

News Announcement

REQUIREMENTS FOR CHEMISTRY MERIT BADGE

SOME OF OUR READERS will have seen this news announcement in the August 31, 1953 issue of *Chemical and Engineering News,* published by the American Chemical Society. For the benefit of all the rest, we are pleased to publish this condensation with the permission of the editors of C&EN. We know that many science teachers serve as Boy Scout counselors and will be interested in the new requirements for the Chemistry Merit Badge.

The Boy Scouts of America have adopted new requirements for the Chemistry Merit Badge that will be issued in the new edition of *Handbook for Boys,* scheduled for publication this September. The new requirements were worked out by an informal group of 103 cooperators from the fields of chemistry, teaching, and Scouting. (These included NSTA members Robert H. Carleton, Alden Struble, and Elbert C. Weaver.) Robert F. Gould, Managing Editor of C&EN, served as chairman.

The revision is part of a realignment program that BSA is conducting to bring all merit badges into better agreement with the objectives of Scouting. The old requirements for Chemistry Merit Badge were out of harmony with these objectives in that they were specialized and relatively academic in approach.

The new requirements are designed to point out the many ways in which chemistry touches a boy's daily life, both at home and in camp. They are a distinct improvement in many ways over the set they replace. Most important, they are oriented toward the scout program of outdoor activities, hobby pursuits, and vocational exploration.

Hobby pursuits are emphasized by the fact that experience with an elementary chemistry set will lend encouragement to try for the badge. Lack of a set will not be a handicap, however, because most of the demonstrations can be done with chemicals found in the home. These replace experiments in the old requirements that called for laboratory facilities.

The new requirements are less academic than the ones they replace; they are designed to appeal to boys from the age of 12 up. Another advantage of the present requirements is that they cover the field more broadly. They will give the boy a better idea of how chemistry touches everything around him and how much more interesting his life can be by knowing the chemical background of the things he sees. Although vocational exploration is an avowed purpose of the merit badge program, the new requirements are designed to make chemistry interesting, not just to the prospective chemist or chemical engineer, but to the future citizen. An example of this is the ninth requirement on the scientific method; it is frankly exploratory and if successful might be incorporated in other science merit badges.

Many in the group of cooperators are now aiding in the preparation of a new pamphlet to accompany Chemistry Merit Badge. This pamphlet, which will sell for 25 cents, will tell a simple story of the chemistry of familiar things and will include information that will aid the Scout to meet the new requirements.

Requirements for Chemistry Merit Badge

1. Do *one* of the following:
   (a) Collect 10 compounds or elements found in the home and write the common name, chemical name, and formula or symbol for each.
   (b) In company with your counselor, follow a route selected by him and name 15 compounds or elements found in nature or in objects seen along the way.
2. Perform experiments to illustrate *four* of the following chemical reactions:
   (a) Neutralization, using an indicator.
   (b) Precipitation of a solid from solution.
   (c) Evolution of a gas.
   (d) Combination of two elements to form a compound.
   (e) Replacement of a metal in a salt by another metal.
3. (a) Demonstrate and discuss the chemistry of a candle flame. Relate this knowledge to the burning of wood as in a campfire.
   (b) Explain how (1) water and (2) sand act to extinguish campfires. Tell what methods are recommended for extinguishing fires involving: (1) cooking fat, (2) oil or gasoline, (3) electrical equipment. Explain how each functions.
4. Explain the changes that occur in nature's (a) water cycle, (b) carbon-oxygen cycle, (c) nitrogen cycle. Describe the chemical reaction that takes place in carbon monoxide poisoning.
5. (a) Explain what is meant by "hard water" and "soft water."
   (b) Do *one* of the following:
      (1) Perform experiments to show how the hardness of water may be reduced.
      (2) Demonstrate the action of soap and synthetic detergents in hard water and explain any differences observed.
6. Tell how the chemical properties of iron, aluminum, copper, and silver influence their usefulness as cooking utensils, as tools, or for other purposes around the camp and home. Describe several means of preventing metal corrosion.
7. Do *one* of the following:
   (a) Visit an industrial plant that makes chemical products and describe the processes involved.
   (b) Visit a laboratory or a commercial establishment using chemical materials and find out how and why the materials are used.
   (c) Visit an experimental farm to learn how chemistry is meeting local problems of soil fertility and pest control.
   (d) Collect samples representing, (1) the manufacture of chemicals from a common source, such as salt, sulfur, or petroleum; or, (2) the use of chemicals in the manufacture of a class of products such as textiles, drugs, or metals. Be prepared to discuss with your counselor the chemistry of the subject chosen.
8. Do *one* of the following and be prepared to discuss with your counselor the chemistry involved in it.
   (a) Make soap from materials available around the campsite or the home.
   (b) Make an electric cell and use it to demonstrate electroplating or the electrolysis of water.
   (c) Treat a piece of cloth or canvas to make it water-repellent.
   (d) Make a two-color flag or pennant by dyeing and/or bleaching cloth.
   (e) Perform experiments and chart experimental data to illustrate *three* different temperature effects of salts in solution.
9. Explain how principles expressed in the Scout Oath and the Scout Law are observed by scientists.

HANOR A. WEBB RETIRES

DR. WEBB, professor of science education at George Peabody College for Teachers, retired from active duty in August, 1953, after 36 years of outstanding service in the field of teacher education in science at that institution. In his early years he acquired valuable experience in teaching on the high school level. In recent years his major work has been in the fields of: materials and methods of teaching science in the elementary and secondary schools, general education science in the junior colleges, and graduate courses in science education. Thousands of those students who have come under his instruction have been inspired by his example to do a better job of teaching science. His influence will be felt in the classrooms of America for many generations to come.

For twenty years he was editor of a weekly classroom paper, *Current Science,* and missed the "dead line" for publication but twice. He developed a *unique* style of writing that is truly *his own,* and through his weekly paper brought the interesting events in science to hundreds of thousands of high school pupils. For two decades he published the annual *High School Science Library* that proved to be a wonderful aid to science teachers and librarians. He has edited the science issues of *Education* since 1936 and has served several terms on the Advisory Board of *The Science Teacher.*

He is co-author of *Early Steps in Science* and *Science by Observation and Experiment,* general science texts on the ninth grade level. Since 1914 he has written many magazine articles on science teaching, and in more recent years has written for *Childcraft* and *Compton's Pictured Encyclopedia.*

During the past three decades Professor Webb has served as a prominent leader in education in the following capacities: Chairman of the Division of Science Instruction, NEA; President of the National Association for Research in Science Teaching; President of the Tennessee Academy of Science; Chairman and Secretary of the Nashville Section, ACS; Secretary of NSTA; Director of Southern Association of Science and Industry; Vice-President of National Council on Elementary Science; Member of Executive Committee of American Nature Study Society; Sponsor of "Science Unlimited" (a local high school club group). He is a Fellow of AAAS and was a member of its Council from 1945 to 1953. He has served as Educational Consultant to certain Southern cities and state colleges, and helped plan and direct the preparation of *A Brief Guide to the Teaching of Science in the Secondary Schools of Florida.*

He is a Methodist, a member of Phi Delta Kappa, Kappa Delta Pi, and the Freolac Club. For many years he taught a large Sunday School class of men at Belmont Methodist Church. He is an interesting, forceful, and popular speaker at Graduating Exercises, Luncheon Clubs, Parent-Teacher meetings, Science Departments of State Education Associations, Church Suppers, and the like. His hobbies are touring, color photography, and old science books.

He was born in Nashville, Tennessee on April 1, 1888. On August 11, 1914, he was married to Willard Holmes Cummings of Trenton, Tennessee. They have four children, John, Ruth, Mary, and Martha. They also have five grandchildren whom they hope to visit more frequently after this August. Their home address is 245 Blue Hills Drive, Nashville 10, Tennessee.

Those who know Professor Webb best, *deeply love and appreciate him not only for his outstanding contributions to science and teacher education, but for what he is as a man.* He is kind and considerate; he has a keen sense of humor; he is an indefatigable worker and a persistent searcher for the *Truth,* believing that "ye shall know the *Truth,* and the *Truth* shall make you free." We sincerely wish him many happy and profitable years of *active retirement.*

Science for Today's Children, the 1953 Yearbook of the NEA Department of Elementary School Principals, is now off the press and available at $3.00 a copy. Containing over 300 pages devoted to a series of 62 short, lively articles, the book offers practical suggestions on classroom projects, methodology, content, using community resources, and the use of science equipment and materials. Opening chapter is by Glenn O. Blough (U. S. Office of Education and NSTA Board of Directors) and explains the role of science in the modern elementary school. Gerald S. Craig (Teachers College, Columbia University and NSTA member) is author of the last article which discusses how science instruction should change during the coming decades. Several other elementary-science members of NSTA have contributed articles also.

Book Reviews

BASIC BIOLOGY, Revised Edition. C. L. Fenton and P. E. Kambly. 726 pp. The Macmillian Company. New York. 1953.

Basic Biology, organized on the unit plan, is a truly basic treatment of familiar major biological principles and concepts. Each unit is prefaced by a motivating overview or a series of problems. Each chapter ends with a summary of the outcome concepts and principles. Discussion and project activities, with self test questions are included. The projects, in the main, are of a very general nature without specific instructions. Simple books, with popular appeal, are suggested for further reading.

The general approach of this book is descriptive, anecdotal, and observational. The conversational style minimizes and simplifies technical nomenclature.

Sepia tone print adds to the attractiveness of the book. There are many fine, clear, well-reproduced photographs. The diagrams give some impression of three dimensions. Most of these are done so skillfully that they resemble photographs. The nonglare stock, the wide spacing between lines, the large size print are in keeping with the needs of poor readers.

Basic Biology is worthwhile for use with "slow learners" and "general" pupils. Exercise of the teacher's judgment, however, is essential for the selection of topics interesting to, and within the experience of pupils in rural or urban communities.

MILTON S. LESSER
Thomas Jefferson High School
Brooklyn, N. Y.

TREES—A GUIDE TO FAMILIAR AMERICAN TREES. Herbert S. Zim and Alexander C. Martin. 157 pp. $1.00. Simon and Schuster, Inc. New York. 1953.

For the beginner who wishes to identify and learn a few facts of interest concerning the trees about him, this book is an excellent pocket-sized manual. Fifth in the series of Golden Nature Guides, TREES maintains the high standard of readability and general usefulness set by the preceding volumes.

A simple illustrated key based on leaf structure quickly indicates the section of the book in which to find material about the specimen in hand. Brief descriptions, supplemented by excellent color illustrations of leaf and fruit, clearly present the most significant identification features. The small range maps included for each of the 140 species are also useful in identification.

The problem of selection of the species to be included has been handled in a way to make the book of greatest usefulness in all parts of the country. Every region will have its locally common trees that are not to be found in this volume, but to describe all species of trees known in this country would make a pocket-sized volume impossible. Most of the trees encountered by the average person will be found in this well-written, well-illustrated nature guide.

RICHARD H. LAPE
Amherst Central High School
Snyder, New York

MATERIALS AND PROCESSES. Max Kohn and Martin J. Starfield. 483 pp. The Macmillan Company, New York, 1952.

Believing that intelligent participation in our world requires an adequate understanding of the underlying principles of our technology, the authors have written a book presenting a broad view of the technological industries. They have done this by tracing the course of basic raw materials from source to ultimate use.

The book is aimed at students in vocational or technical high schools and institutes, apprentices and members of adult training programs, industrial arts classes, and industrial material salesmen. The book may be used as a textbook in such training activities, or as a reference work and source of related technical information.

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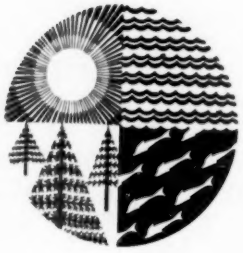

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written. The authors have taken pains to keep within the scope of language and concept limits of their readers. Moreover there are ample questions and suggestions for further work at the end of each chapter. Bibliography and sources of visual aids have been provided.

IRVING KAMIL
Mark Hopkins Junior High School
Brooklyn, New York

THE JUNIOR BOOK OF INSECTS. Edwin Way Teale. 249 pp. $3.75. E. P. Dutton and Co., Inc., New York. 1953.

Originally published as *The Boy's Book of Insects* in six printings, this reissue has few changes except for a new chapter (XXVI) on insect life histories. Teachers, pupils, and nature enthusiasts will find many practical ideas for insect collecting, simple experiments, structure studies, field trips, identification, habitat and life history studies, maintenance of insect "zoos," and much interesting information in this fascinating book written and illustrated by a prolific author, photographer-artist, and life-long student of insect life. The bibliography has been brought up to date. A comprehensive index, printed in larger type, adds appreciably to the usefulness of the book.

B. BERNARR VANCE,
Daniel Kiser High School
Dayton, Ohio

GRASS, OUR GREATEST CROP. Sarah R. Riedman. 23 pp. $3.00. Thomas Nelson and Sons. New York. 1952.

Grass, Our Greatest Crop is a fascinating book about a common group of plants that affect us greatly. It gives the reader a vast sweep of interesting information concerning grass and its important role in the lives of people all over the world. Not only does one reading this book become acquainted with many representatives of the 4000 species of the grass family, where they grow, how they grow, what they are used for and their limitations, but one comes to appreciate how grasses have spread from pole to pole, how mankind has changed them, how they are stored for cattle feed, how grains are processed, the important role of grass in preventing erosion, and especially how intimately man's foolish and wise practices with grass affect his own welfare.

This treatment, which could be so dull and technical, lives in the mind of the reader as again and again some new connection with his own experience makes grass become increasingly significant. In the broad sweep, some concepts are left over-simplified, incomplete, or with a slight tinge of teology—but this is almost unavoidable when writing about the scientific aspects of any topic in lay language. The numerous illustrations add much interest.

Children from the intermediate grades through high school will appreciate this book—and I should think that parents would enjoy having it in their home library.

N. E. BINGHAM
University of Florida
Gainesville, Florida

ALL KINDS OF BABIES AND HOW THEY GROW. Millicent Selsam. $2.00. William R. Scott, Inc. New York. 1953.

All Kinds of Babies and How They Grow is a book receptive to children both young and old alike. The author has developed the story of the birth and growth of a variety of animals in a very natural and proper setting.

The excellent illustrations and the clarity of presentation helps the child orient himself to the pattern of life. The book is written in simple style and vocabulary with an organizational feature especially appealing to children.

Miss Selsam's technique of using rhyme and sound words makes this science story a delightful and somewhat humorous experience for children to hear. The book also serves as an excellent opportunity for the parent and teacher to expand significant concepts of sex education.

ALBERT PILTZ
University of Florida
Gainesville, Florida

DOWNY WOODPECKER. Paul McCutcheon Sears. 44 pp. $2.00 Holiday House. New York. 1953.

Downy Woodpecker is an account of the life cycle of one of America's most popular birds. It provides valuable ornithological information for youngsters in that it describes the life and activities of the woodpecker through the seasons, and cleverly relates the bird's experiences with his physical and biological environment. The values for conservation are implied but unmistakably present.

Word usage and science concept is within the range of understanding of most young children and presented with exceptional clarity.

There is evidence of anthropomorphism but it effectively heightens the interest of the very young reader.

ALBERT PILTZ
University of Florida
Gainesville, Florida

WOLFLE—continued from page 160

more difficult because it is hard to plan a program—be it scholarship, counseling, or what not—which will influence those students who had not otherwise planned to go to college without also influencing the choices made by those who were planning to go to college anyway.

It seems highly desirable to attempt to interest a larger number of the best high school graduates in going to college. They are the potential leaders of tomorrow. With a bachelor's or some higher degree and with the ability which makes their college training profitable they will be the industrial managers, the research scientists, the teachers, humanists, social scientists, military leaders, and others who will manage our complex social, military, industrial, and governmental machinery, and we hope, lead us successfully through the troubled times in which we live.

It is easier to make narrow plans than broad ones. It is easy to say that we should lead more students into the fields of science because the sciences need more competent workers. They do. But I am reminded of the policy statement of the committee which wrote the fellowship recommendations of Dr. Bush's *Sciene, The Endless Frontier.* This is their statement:

"The uses to which high ability in youth can be put are various and, to a large extent, are determined by social pressures and rewards. When aided by selective devices for picking out scientifically talented youth, it is clear that large sums of money for scholarships and fellowships and monetary and other rewards in disproportionate amounts might draw into science too large a percentage of the Nation's high ability, with a result highly detrimental to the Nation and to science. Plans for the discovery and development of scientific talent must be related to the other needs of society for high ability; science, in the words of the man in the streets, must not, and must not try to, hog it all. This is our deep conviction, and therefore the plans that we shall propose herein will endeavor to relate the need of the Nation for science to the needs of the Nation for high-grade trained minds in other fields. There is never enough ability at high levels to satisfy all the needs of the Nation; we would not seek to draw into science any more of it than science's proportionate share." (Bush, V. *Science, The Endless Frontier.* Washington, D. C.: Gov't Printing Office, 1945, page 136.)

As a matter of psychological science it would be interesting to be able to differentiate those high school students who have the potential for successful careers in science and mathematics from those who have the potential for successful careers in other fields. But as a matter of social policy it would be preferable to identify those high school students who have the potential for successful careers in any of the fields of advanced training and to provide opportunities for their development, letting each be influenced by his own wishes, by the competing attractions of a variety of fields, and by his own decisions as to which career is best for him. Within such a program there would be many who would enter the sciences. Science would profit as much from the broader program as from a narrower one; the country would profit more.

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THE A-B-C's OF ALUMINUM. *Reynolds Metals Company.* In simple non-technical language, this booklet tells the story of who discovered aluminum, what it is and what its properties are like, how it is made into useful products, etc. 32 pp.; free.

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In order to give educational film libraries full advantage of the bill, Teaching Film Custodians, Inc., immediately announced that it will assume all shipping costs on its films for delivery by parcel post within the United States. TFC is the educational service organization which cooperates with the Film Excerpt Committee of NSTA in the selection and preparation of films produced by member companies of the Motion Picture Association of America for use in science classes.

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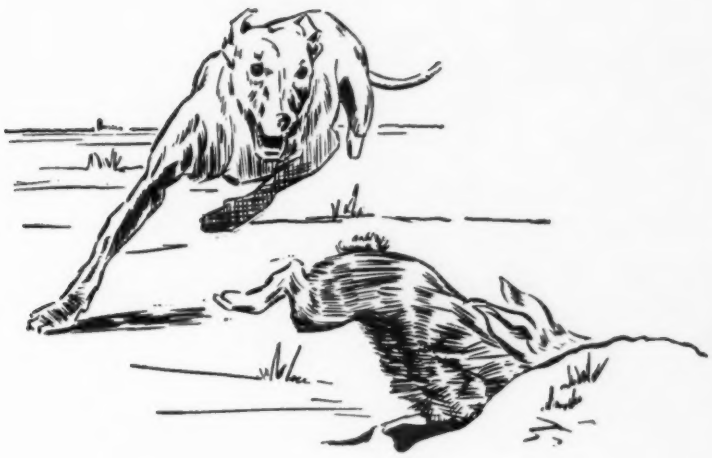

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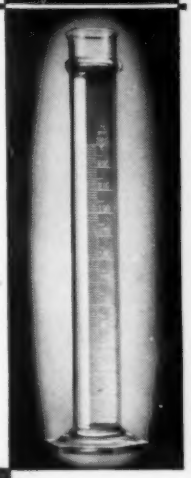

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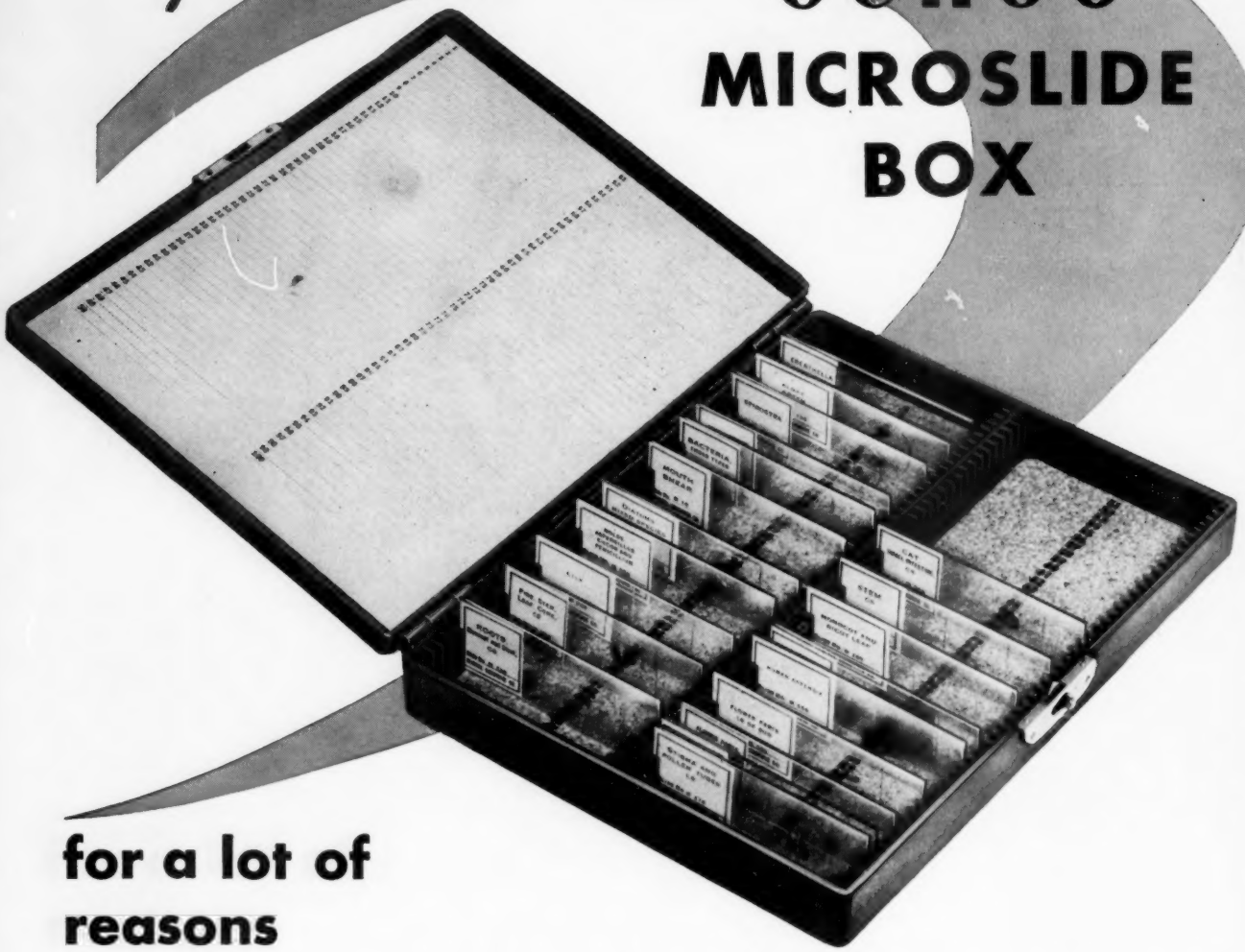

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